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THE MONTH

The Symposium

THE symposium this month deals with a subject of interest and importance to all general practitioners. "Athletic Injuries" have assumed increasing importance of recent years, not so much because of any dramatic advances in treatment, but because of the realization that if properly treated from the beginning, the period of disability is so appreciably reduced and the ultimate result so satisfactory. This means that practitioners must be able to recognize, when they first see the patient, which of the cases they can treat, and which should be referred at once for specialist treatment. The subjects chosen for discussion are those most likely to be encountered in general practice, and readers will be particularly interested in the article by Dr. Thorndike of Harvard University, summarizing as it does, the practical results of a lifetime devoted to the study of the treatment and prevention of athletic injuries. Whilst relatively few of us are called upon to treat professional athletes, many useful lessons will be learned from the article on "Injuries to the Professional Association Footballer". Where for an amateur athlete an injury has merely a high nuisance value, for the professional it may mean all the difference between compulsory retirement at an early age or the ability to carry on for the full period of activity normally allowed to him. The cooperation at the Arsenal Football Club between surgeons, trainers and players is an excellent example of how "occupational hazards" should be dealt with.

"Thanks from Britain"

THE National Thanksgiving Fund which has just been launched by the Lord Mayor of London supported by leaders from every field of national life is one which will commend itself to every member of the medical profession. The aim of the Fund is to demonstrate in a practical way the gratitude of the people of Great Britain for the overwhelming generosity shown to them during and since the 1939-45 war by the peoples of the Commonwealth and the United States of America, who since 1940 have sent to this country food gifts to the value of £80,000,000. The proceeds of the Fund are to be used principally to develop a centre in London for students from the Commonwealth and the United States of America. The plan is to erect an £800,000 building for married and women students from these countries in Mecklenburgh Square, opposite London House. It is also planned to reconstruct the Georgian houses on the east side of the Square for male students from the

United States of America, at a cost of £250,000, and a further £600,000 is to be set aside for the upkeep and maintenance of these two buildings and of London House which, of course, is already well established as a residential hostel for male students from the Commonwealth. A further £150,000 is to be earmarked for "The Burn", Edzell, Angus, the overseas students' hostel in Scotland, and it is proposed to share £200,000 between the Royal Empire Society, the Victorian League, the Overseas League, the Dominions' Fellowship Trust, and the English-Speaking Union to assist them in their work for students and other visitors from overseas. Any bank or post office will accept donations, or they may be sent direct to the Lord Mayor of London, The Manor House, London, E.C.4, marking the envelope "National Thanksgiving Fund".

The Cure of Books

With an imaginative touch that augurs well for the success of its appeal for gifts of 500,000 books, the St. John and Red Cross Hospital Library Department chose "The Cure of Books" as the name for the exhibition which it recently organized in the premises of the National Book League. To medical visitors the most interesting feature of the exhibition was the iron lung equipped with an electrical device for turning the pages of a book, the page-turner being worked by movements of the patient's chin. There was also a microfilm projector which reflects the page of a book on to the ceiling to be read by the patient. The Hospital Library Department with its staff of over 4000 voluntary helpers now issues 500,000 books annually in over 1,800 Service and civilian hospitals in England, Wales and Northern Ireland, and to 67 Service hospitals in Germany, the Middle East and the Far East. In addition to appeals for copies of books the department is appealing for voluntary helpers for three purposes: hospital librarians, serving as book collectors, book-binders, and repairers of books.

B.M.A. and Nutrition

The Report of the British Medical Association Committee on Nutrition is more outstanding for its enunciation of general principles than for its detailed recommendations. This is a refreshingly healthy attitude to a subject upon which in the past so much nonsense has been talked by both scientists and doctors, not to mention food faddists. By their careful analysis of previous reports on the subject the Committee has shown the inadequacies of the premises upon which these reports have been based. Not satisfied with a merely negative approach to the problem, the Committee has indicated the lines which future investigations should follow. The comments on the changing feeding habits of the nation will be of interest to the sociologist, but doctors will be more interested in the conclusions concerning the adverse nutritional effects of the dullness and monotony of our post-war diet. There will be general agreement with the conclusion that "the health of the population as a whole, despite the trials and tribulations of recent years, has been well maintained", and the recommendation emphasizing

"the desirability of increasing the supply and variety of foods and of removing all restrictions on the purchase of food as soon as this can be done without detriment to the nutrition of any section of the world population". This is a report which should be carefully studied by all practitioners at their leisure, and it will presumably be recommended to all senior medical students as an essential introduction to the study of nutrition. Copies, price 7*s.* 6*d.*, can be obtained from any bookseller, or from the British Medical Association.

Kind Killing

UNDER the title of "Kind Killing", UFAW (The Universities Federation for Animal Welfare) has recently published a most useful leaflet "intended to help those who may have to destroy animals when there are no experts available". The "putting to sleep" of pet animals is a problem which is often referred to general practitioners when there is no veterinary surgeon available, and this leaflet gives all the necessary detailed information for the most humane and effective way of carrying out this unpleasant task. The leaflet is so written that it can be easily understood by lay readers. It is as comprehensive as it is practical, and deals with the destruction not only of mammals, but also of reptiles and fish; even tortoises are included. It is the practical aspect of the leaflet, however, which will commend it most widely. In most cases alternative methods are given, and practically always these include at least one method that can be used without any elaborate apparatus or without drugs. Whilst many old methods are given approval, there are others which are not recommended. For instance, drowning is not recommended for new-born kittens or puppies. Incidentally, emphasis is laid upon the desirability of removing kittens and puppies from their mothers within the first three days of birth, and preferably the first time the mother leaves them. Attention is also drawn to the fact that lobsters and crabs show no signs of distress if they are first placed in cold water and this is raised slowly to the boil; by this method they die of heat stroke. The colour change takes place before the death of the animal. Full details are also given of the use of nembutal, chloroform, carbon monoxide, and shooting. This is a leaflet which every rural practitioner should possess, and it is one which he can recommend without hesitation to anyone seeking information on the subject. (UFAW, 284 Regent's Park Road, London, N.3, price 3*d.*)

G.P. and Consultant

A READER from Lancashire has written to us, taking exception to the suggestion which he considers is implicit in Professor Robert Platt's article on "The responsibility of modern medicine" (*The Practitioner*, January 1950, p. 72), that in modern medicine the irresponsibility is that of the general practitioner. After giving details of a case of his own in which he certainly did not appear to obtain satisfactory service from hospital consultants, he concludes that "it would seem from this experience that it is not only in general practice that medical education can be improved". We have re-read Professor Platt's

article and can find no suggestion that the author was attempting to adjudicate between the relative defects of general practitioners and consultants. Our reader's impression presumably arose from the fact that Professor Platt in his article was primarily concerned with the impact of modern medicine on the general practitioner. There are few, however, either consultants or general practitioners, who will not agree that consultants require to devote as much attention to their standards and methods of work in these days as do general practitioners. There are also few who do not know, in their own experience, of general practitioners who have a legitimate grouse in that they have not received full reports concerning their patients from the hospital consultants to whom they were referred. This is by no means a new complaint of general practitioners, but it is one which has inevitably been accentuated by the rushed introduction of the National Health Service. Even the most conscientious general practitioners are finding it necessary to refer a larger proportion of their patients to hospital consultants, and this at a time when hospital outpatient departments are obviously grossly overcrowded. Correspondingly therefore, even the most conscientious hospital consultant is finding it increasingly difficult to maintain that personal contact with the general practitioners in his area that the best type of consultant cultivated in the pre-N.H.S. days. The solution of this problem lies, not in needless bickering between consultant and general practitioner, but in an attempt on both sides to understand each other's problems and to do all that can be done to ensure that cordial cooperation from which alone the patient will obtain the best service.

The Dermatologist as Detective

THE dermatologist has one great advantage over his colleagues in other branches of medicine: he can see the lesion with which he is dealing. He is therefore in a relatively strong position in that he can attempt to reproduce the condition, if he should so desire, in an endeavour to detect the causative agent. This, of course, is particularly true of contact dermatitis, as was well brought out by Dr. Vickers' article last month. Whether this be the reason or not, there is little doubt that the modern dermatologist has developed much of the technique of the detective: a potentiality which was early recognized by Conan Doyle in some of his famous Sherlock Holmes stories. The latest example of the dermatologist as detective comes from Holland, where, according to the *Journal of the American Medical Association* (January 14, 1950, p. 123), the dermatologists of Amsterdam last summer were puzzled by a spate of cases of skin lesions of the calves in women. Finally the municipal authorities took up the matter and invited Professor Prakken to investigate the problem. The result of the investigation was definite—if somewhat disconcerting. In the terse terms of the American report: "Professor Prakken . . . found that these patients regularly used the same streetcar at the same hour. Inside the wooden construction of the seats of the cars nests of bugs were discovered".

TENNIS ELBOW

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THE condition of tennis elbow, which has also been called epicondylitis and epicondylalgia, is characterized by pain over the outer side of the radio-humeral joint, usually just above the joint line. The name is a misnomer, for tennis as an etiological factor accounts for only a small number of the cases. It occurs in adults as a result not only of sports requiring the use of a racquet, but also of occupations demanding lifting and sudden flexion and contraction of the elbow, such as are required in carrying heavy suitcases, playing the violin, and in the everyday work of blacksmiths and housewives. In some cases the symptoms follow direct trauma to the area.

The name persists, however, and is given to a clinical syndrome of pain and tenderness of variable intensity, accompanied not infrequently by some swelling in or about the epicondyle. The pain usually comes on suddenly during some characteristic racquet game or occupation and rapidly becomes worse. It is relieved by rest but returns when the arm is used again. There is extreme, often exquisite, tenderness over a small area not bigger than that covered by an old silver threepenny bit. Often the pain radiates down the back of the forearm into the extensor muscle bellies. It is aggravated by gripping anything tightly with the hand, and direct trauma, as often occurs by knocking the elbow on the wood while passing through a doorway, causes an acute tingling radiating pain. Games and occupations entailing a strong grip, as in turning a door-handle, are impossible; often at a later stage extension of the elbow and pronation of the forearm are limited.

THE PATHOLOGICAL LESION

The signs and symptoms of tennis elbow are constant and it might therefore be supposed that this condition is caused by one pathological lesion. This, however, is not so and, indeed, Carp (1921), in an admirable monograph, lists no less than ten theories which have been advanced by various authors concerning the etiology.

The condition was first described in 1896 by Bernhardt who thought it was a neuralgia, which even now seems a reasonable theory so far as it goes. Some of the earlier conceptions would not now be acceptable, and among this group are arthritis of the radio-humeral joint, involvement of the subcutaneous fat and fascia of the epicondyle, and malalignment of the radio-humeral joint.

The possible causes about which debate still continues are:—

(1) Periostitis of the epicondyle.

(2) Myo-fasciitis of the extensor origin.
(3) Radio-humeral bursitis.
(4) An intra-articular lesion.
(5) Adhesions, possibly a sequel to some of the above.

EPICONDYLAR PERIOSTITIS AND MYO-FASCIITIS OF THE EXTENSOR ORIGIN

The epicondyle does not demonstrate periostitis, although the possibility of an osteitis warrants consideration. Osteitis may be considered along with myo-fasciitis, for the two are more or less similar and an inflammation in one may extend to the neighbouring tissue. The most probable and generally accepted theory is that an incomplete tear of the extensors takes place at their origin from the epicondyle and that a secondary traumatic or toxic reaction takes place in this area. The muscle particularly affected is usually the extensor carpi radialis brevis. Much of the treatment is based on the incompleteness of the tear, and when this is rendered complete and lengthening takes place the strain is relieved and the symptoms disappear. Epicondylitis, often accompanied by bone changes, is usually a feature of this true type of tennis elbow. According to Hohmann (1933), the reason why the origin of the extensors is always involved in a condition which is caused essentially by strong flexion is that constant action of the extensors is required to give synergic action to the flexors. This is not easy to follow, for the converse should also hold. I have seen a comparable condition affecting the medial epicondyle on only two occasions.

RADIO-HUMERAL BURSITIS

There appears to be little doubt that in certain cases a bursa is present, probably an adventitious one. Grinnel dissected eighteen cadavers, nearly all males, and found bursæ on the right side in nine cases and on the left side in six. In five cases the bursæ were bilateral. This bursa is apparently difficult to see in a routine dissection; it lies deep to the common extensor origin, just below the epicondyle and over the radio-humeral joint. It is normally 1 by 0.5 cm., and its walls are very thin and friable. Calcification of this bursa has often been described and shown in skiagrams, whilst various authorities—Osgood, Kleinberg, and others—have seen the bursa on the operation table. Carp (1921) describes eight cases treated on this basis, operation being performed on one. He found a calcified bursa, the wall of which was intimately adherent to the external lateral ligament and to the capsule of the joint. Milky sterile fluid formed the content. Complete recovery followed excision.

AN INTRA-ARTICULAR LESION

A delicate fringe of synovial membrane lies at the periphery of the radio-

humeral joint and often there is a specially large tag posteriorly. A suggestion has been made that this posterior tag may become displaced into the joint as the result of an unguarded movement and get caught. If it does not immediately escape it becomes swollen, and in this way produces the symptoms. Apparently in this type the pain is more posterior in position, as is also the tenderness, whilst limitation of joint movement is a more prominent feature than in the other types.

ADHESIONS

That these do occur, is extremely likely. They may be the direct result of an intra-articular lesion, or may be secondary to other lesions in the neighbourhood. Manipulation of the joint in the chronic neglected case is often successful and is frequently accompanied by a crack or a click. Such an occurrence suggests the presence of adhesions in the chronic case. Manipulation is used by Mills (1928, 1937) in the acute case also, and he cites a case in which a patient's elbow "went out"; it was immediately manipulated and he could play tennis in the afternoon. This, however, is more suggestive of reduction of a synovial tag.

It seems likely that the great majority of the cases result from a myofasciitis following an incomplete tear, although there may be an occasional case caused by some intra-articular lesion such as is described.

DIAGNOSIS

Diagnosis is not difficult and is made from the history, the site of tenderness, the pain and its radiation. It is only in rare cases that a skiagram shows any abnormality. Occasionally there may be some calcification lateral to the epicondyle and, infrequently, roughening of the bone under the extensor origin.

PROGNOSIS

The symptoms seldom persist for over a year when untreated, and once they have subsided they do not recur, even if the game or occupation responsible for the condition is indulged in again.

TREATMENT

It is obvious that the treatment will vary according to the conception of the pathology of the particular case. Probably there has been some confusion of ideas owing to the fact that there are at least two distinct possibilities—one the inflammatory lesion, the other the internal derangement. The two conditions may be distinguished by their different behaviour in regard to pronation and supination. These movements are always painful and limited in the intra-articular lesion. Full extension is also painful in this type, even with the extensors relaxed by dorsiflexion of the wrist and extension of the

fingers. In the myositis type rotation movements are quite painless and extension is only painful if the wrist is flexed and the grip closed.

(1) *Treatment of the Extensor Origin Lesion*

Conservative treatment.—Immobilization by means of a sling and a cock-up splint is the most rational way of relaxing the extensor muscles and of allowing healing to take place. Such a method has to be persisted in for some three to four weeks. It is most effective at an early stage. Cyriax (1936) points out that this appears to be a cheap and effective, although a slow and cumbersome, method of treatment, most suited to the recent case. He also points out, however, that this method, if the pathology is an incomplete tear, is open to the theoretical objection that it makes recurrence possible, since healing without lengthening will occur. Such conservative treatment, however, even if accompanied by radiant heat or short wave diathermy, is seldom completely successful. Injection of procaine followed by full use often aggravates the pain and does not appear to be any more successful. Deep X-ray therapy is used, but with mixed results, as might be expected. If the symptoms are severe, manipulative or operative treatment is indicated.

Manipulation.—The mobilization consists of various modifications of forcing full extension of the elbow, and the basis of this is to convert an incomplete tear into a complete one. The method most usually adopted is that of Mills (1928, 1937).

The forearm is fully pronated and the wrist and fingers flexed. The elbow is then fully extended. Thus the greatest possible pull is exerted on the muscles attached to the lateral epicondyle. In early cases the manipulation may be carried out without an anæsthetic, but in later ones anæsthesia is necessary, so that the maximum pull on the extensors may be achieved.

Operation.—Should the symptoms continue after manipulative treatment, operation is indicated. Although several somewhat different operations have been described, the one feature common to all is a dissection of the common extensor origin from the epicondyle. This results in a fibrosis and healing of the torn tendon, along with some lengthening. Watson Jones (1943) points out that it releases the strain on the incomplete lesion, allows repair of the tendon with slight lengthening, and therefore removes the localized traction of a strong muscle from painful periosteum.

Hohmann's method.—A short straight incision is made over the lateral epicondyle. The upper part of the common extensor origin, chiefly the origin of the extensor carpi radialis brevis, is exposed and divided transversely right across (Hohmann, 1933).

A similar result is achieved by erasing the common extensor origin from its attachment to the bone, and with this method there is the added benefit of a greater degree of fibrosis. A sling is used for a few days but complete immobilization is not advocated. Fourteen of Hohmann's cases were cured within a week, and I have obtained comparable results. The grip is not weakened afterwards.

(2) *Treatment of the Intra-articular Lesion*

Operation should be undertaken. This consists of exploration of the joint and removal of any hyperæmic synovial fringes. Trethowan (1929) was successful in curing eight consecutive cases by such an operation. In all of Trethowan's cases it is interesting to note that the tenderness was greatest on the *antero*-lateral aspect of the radio-humeral joint, so it is possible that the fibrosis produced was, in part at any rate, helpful in procuring the good results.

Massage.—Very heavy deep massage is often practised in such cases to irritate the lesion and thus produce a reaction with consequent fibrosis and healing. It is a somewhat painful procedure but in many cases leads to good results, although it is not improbable that recurrence may take place.

SUMMARY

The probability is that the typical tennis elbow is the result of an incomplete tear of the extensor origin from the lateral epicondyle, followed by a reactive inflammatory deposit.

Rest in an appropriate position is a reasonable treatment for early cases. In those not responding and in later cases, manipulation will cure an appreciable percentage. For recalcitrant cases, operation is indicated, and of the many procedures suggested the one advocated is an erasion of the extensor origin from the lateral epicondyle.

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INJURIES TO THE PROFESSIONAL ASSOCIATION FOOTBALLER

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Professional association football is for the majority of its players a full-time occupation requiring daily training. The number of matches played in the season, the speed and intensity of professional football associated with repeated though often "minor" injuries to the lower limbs, restrict active playing life to between ten or fifteen years. Hence it will be understood that the player has to look after himself both on and off the field, in his own interest as well as that of his club. Those in charge of the players must be conversant with the daily routine of training, the stresses and strains of the game, both physical and mental, and the rehabilitation which is suitable for the training in this particular game following any form of injury or operation. The best results can only be achieved by a close co-operation between the Club medical officer, the manager, trainer and the surgeons.

Now let us try to give a picture of the conditions just after a match:—The players' dressing room after a game is a busy scene, as the men take off their dirty clothes and rest for a few minutes before bathing. Often the player has finished the game with considerable difficulty, or has been a "passenger" because of an injury, and several others have abrasions, sprains or "pulled muscles" which need treatment.

The Club doctor assesses their injuries in consultation with the manager and trainer, and there is a sense of urgency because their aim is not only to get the men fit again on the following Saturday, or even sooner, but fit enough to carry out training during the week. For this the Arsenal have a fully equipped physiotherapy and rehabilitation department, with a manager and trainer—both old players themselves—who are experts in physiotherapy and rehabilitation and in the use of all the necessary apparatus for electrical treatment and remedial exercises, but where this does not apply it is profitable to employ a physiotherapist.

The injuries sort themselves out chiefly into those of skin, muscles, ligaments and joints. Fractures are relatively rare, especially when one considers the hard tackling in a closely fought game. Injuries can be manifold. It would be rash to ignore the slightest abrasion sustained on the field of

play. In the same way it would be rash to take for granted that the player is all right after receiving what may look like a minor injury. Players are of different temperaments, and one whom the medical adviser must be extremely careful of is the man who is strong, tough, and says he is feeling all right when it is possible that he has an injury which, although in his strength he will try to carry off, will have future repercussions on his playing career. Muscle, joint and ligament injuries are always put at rest for twenty-four hours, and reassessed in the light of sufficient training being possible in time to play in the next match.

It may be noted here that no case of tetanus or gas infection of wounds has occurred at the Arsenal Club, although tetanus antitoxin and anti-gas serum are not given prophylactically. After a change of fertilizer used on the ground some years ago there was an outbreak of wound infection of such severity that visiting clubs had to be warned that more than ordinary care must be taken with every minor injury.

MUSCLE INJURIES

Pulled muscle is a rupture of some fibres of the muscle belly with or without a tear in the muscle sheath. The symptoms are localized pain in the affected muscle with inability to run or kick (hit) a ball. It occurs most often in the rectus femoris and is the result of indirect violence. It must be confessed that we know little about its treatment, except that rest is essential and that too vigorous massage or other physiotherapy delays rather than hastens recovery. Heat combined with gentle active movements within the painless range are all that should be given at first, and activity must be limited to that which does not cause any increase in symptoms. Recovery is often slow, so that a pulled muscle is the bugbear of a trainer, and may keep the player off the field for many weeks. It is a great mistake to play him again until he is symptom-free, as the muscle is liable to break down under strain, and the condition then causes a chronic disability. Full training should not be undertaken until completely symptom-free, and this is invariably three weeks. Complete rupture of a muscle is a very rare occurrence.

Intramuscular hæmatoma.—This is a not uncommon injury and can occur either from a kick or a collision with another player or from a fall on to hard ground. Aspiration has not been found particularly useful in these cases. Here again it is a mistake to force the pace by putting the player on to strenuous training until the muscle has settled down. Calcification in a hæmatoma is a complication which may cause serious disability and which may require excision of the calcified mass. Figure 1 is an example of this, for which excision was necessary. The player subsequently returned to first-class football.

Myositis ossificans can occur in the adductor or quadriceps group and may become so extensive that movement at the hip or knee is seriously

limited. It follows repeated strains causing rupture and intramuscular hæmorrhage. It is doubtful whether it can be prevented except by complete rest. Figure 2 shows an ossified mass attached to the inner aspect of the femur and a spicule extending up to the adductor tubercle. In this case excision was not practicable. Eventually such a condition will put a player out of football, although for ordinary life the disability may be relatively slight.

FIG. 1.—A large calcified mass is present in the adductor region. As it gave rise to some disability, it was removed, and the patient continued to play football after operation.

FIG. 2.—A striking example of myositis ossificans in the adductor muscles. It developed slowly over several years.

SOME TYPES OF INJURY: ILLUSTRATIVE CASES

(1) Fatal injuries are rare, but there has been one in the Arsenal Club.

On Christmas Eve 1938, a Welsh amateur international goalkeeper, aged nineteen, was playing for the reserve team at home. He was struck in the epigastrium by the ball at 3.50, played brilliantly until the end of the game at 4.10, and did not report any injury in the dressing room. On his way home on the tube railway he was seized with abdominal pain and vomiting. After arriving home he sent for the Club doctor at 9.30, but owing to the frost-bound condition of the roads on a snowy

night he did not reach hospital until nearly midnight. He gave a history of indigestion relieved by eating chocolate. On examination, there was tenderness in the epigastrium with rigidity of the recti muscles and a temperature of 99° F. (37.2° C.). Perforated duodenal ulcer was diagnosed. At operation, a perforation the size of the head of a large pin was found in the centre of an indurated œdematous area three-quarters of an inch in diameter on the front of the first part of the duodenum. The perforation was closed by two layers of sutures and an omental graft. The right kidney pouch and pelvis were full of purulent fluid and were drained. He died a week after the operation. The post-mortem examination showed that the perforation was securely sutured and watertight. There was a posterior "kissing" ulcer which had not perforated. These were joined by a third ulcer on the upper part of the duodenum, forming a saddle. There was no pus in the right kidney pouch or in the pelvis. The coroner gave a verdict of accidental death from a blow in the epigastrium, causing perforation of the ulcer, in the tube railway on his way home.

(2) A recurrent subcoracoid dislocation of the right shoulder ended the career of an international goalkeeper at the age of twenty-five. The shoulder dislocated several times when tipping the ball over the cross bar. He stopped playing football in March 1935. In June 1935 he dislocated the joint again while swimming in the sea and had to reach the shore by swimming on his back. It was our opinion that he would never play in goal again, and that operation would not alter this prognosis. An orthopædic surgeon was consulted who said there was a fifty-fifty chance of making the shoulder fit by Clairmont's operation. The operation was done by another surgeon who had even greater confidence in its success, but the shoulder redislocated in the first half of a match in February 1936.

(3) In February 1935 a famous outside right collided with a photographer during a match and injured the upper and inner part of his left thigh. In March 1935 there was a hard mass in the upper part of the adductor longus but no opacity was seen in an X-ray. A month later the X-ray showed a large ossifying mass. He was also a professional County cricketer and was allowed to play in first-class cricket, using a box to protect the upper part of his left groin when batting. X-ray examination four months later showed an ossifying mass attached to the pubic bone at the site of origin of the adductor longus. The smooth free end projected under the femoral vein and was palpable under the skin. A month later, at the end of the cricket season, the piece of bone was removed with a chisel. He resumed first-class football in the middle of October 1935.

In September 1936, the same player, while running down the right wing, fell over a parapet four feet high at the end of the ground. X-ray examination showed a fracture of the second and third right lumbar transverse processes, and fractured right metacarpal. After three weeks' rest, he resumed light training. In mid-October he was again playing in first-class football and appeared in the Final of the Football Association Cup at Wembley.

(4) The X-ray film shown in figure 2 is that of a well-known centre half. When the film was taken he was still playing regularly in first-class football, despite the severe degree of traumatic myositis ossificans, the occupational disease of footballers, which is shown in the film. He served as a Captain in the Army in the second World War.

(5) An English international centre forward was injured in the left groin by the knee of the opposing goalkeeper. There was bruising with a rounded swelling in the left inguinal canal, projecting through the external ring. A diagnosis was made of hæmatoma of the cord, and rest and bandaging were advised. Eleven days later the swelling at the external ring had an impulse on coughing. At operation an oblique hernial sac was ligatured and excised, the transversalis fascia was sutured, a hæmatoma of the cord was evacuated and many vessels tied. He played cricket that summer and again resumed his place in First Division Football until the outbreak of the war.

A most troublesome injury is the development of a painful fibrous mass

in front of the tendo Achillis. On one occasion such a mass was excised and the player resumed first-class football.

Heading the ball does not cause any harm, such as the "punch drunkenness" of boxers. However, a full back used to have attacks of unconsciousness after heading a heavy ball, during which he lay flat on his back for a period which seemed like minutes but actually must have been seconds, for he resumed play without being taken off the field. A further case of such attacks has been noted recently in a player who, on occasions, has had loss of use of the left upper and lower limbs and loss of speech occurring about half an hour after the match. These signs usually last for about ten to fifteen minutes and are followed by severe headaches which last up to twenty-four hours.

INJURY TO THE KNEE

This is the most common injury and presents problems both in diagnosis and treatment. There are, however, two points in the player's favour: the first is the high degree of development in his quadriceps, and the second is

FIGS. 3 and 4.—Two loose bodies are present, one in the suprapatellar pouch above the external epicondyle, and one in the posterior compartment to the inner side of the tibial spine. This footballer had a medial menisectomy 11 years ago, and the loose bodies were removed last year. He is now playing regularly in spite of well-marked arthritis, evidence of which is apparent in the X-rays.

that in the course of his training he learns the correct timing for going into a tackle and the importance of having his muscles braced at the moment of impact. The injury usually occurs when he is caught off his guard or when he is tackled incorrectly. An example of the first is when two players jump to head a ball and collide in mid-air, so that one player lands off his balance, and an adduction or abduction strain is thrown upon the knee. The other point often noted is that the degree of trauma bears little relationship to the severity of the injury: one player suffered a complete rupture of the external lateral ligament in a fall when the knee was subjected to little if any violence.

Rupture of the external lateral ligament of the knee.—Complete rupture has occurred twice. On one occasion it happened in a "friendly" game and neither the player nor the spectators were aware that the injury was a serious one, and it seemed that the knee had not been subjected to any great violence. In both cases the external ligament was reconstituted by turning down a strip of fascia lata and suturing it to the lower attachment on the head of the fibula. The only technical difficulty arises from the bulging of the highly developed quadriceps, and it was not found possible to get the edges of the fascia lata together. However, the resulting muscle hernia caused no appreciable disability. One man subsequently played football regularly for another club; and, although he was lost sight of, the fact that he was able to play regularly indicates that he regained full function and that the knee was stable. The other man took up farming; there is a little lateral instability, but he says that the knee gives him very little trouble even in walking over rough ground.

In cases of complete rupture this operation offers a good chance of a stable knee.

Another complicating factor is that most players develop an *osteoarthritis* as a result of repeated minor injuries; and this is often confirmed at operation if the knee is opened for a menisectomy. Undoubtedly the arthritis retards recovery if the knee develops synovitis after injury; but it is most striking that quite an advanced degree of arthritis, and even some ligamentous laxity, are compatible with full activity, provided the quadriceps is well developed. Figures 3 and 4 show two loose bodies in the knee, one in the suprapatellar pouch above the external epicondyle, and one in the posterior compartment to the inner side of the tibial spine. This footballer had a medial menisectomy eleven years ago and the loose bodies were removed last year. He is now playing regularly in spite of well-marked arthritis, evidence of which is apparent in the X-rays.

Clearly the diagnosis of football injuries does not differ in any essentials from that in the case of other knee injuries and, as in other injuries, the diagnosis may be clear-cut, or may present some difficulty; but the importance of getting the player fit in the shortest possible time, and the fact that he must be one hundred per cent. fit, does complicate the timing of an exploration of the knee. A recently injured knee presents many signs suggestive of a torn cartilage—loss of full extension, tenderness over the joint line, and pain on rotation of the tibia. In our view an operation for menisectomy should seldom if ever be undertaken immediately after the first injury to a knee. There are three reasons for this: first, the synovitis with the swollen hyperæmic synovial membrane makes the operation more difficult, especially in the case of the external cartilage (this may be compared with the difference between removing an acute and an interval appendix); secondly, the engorged synovial membrane pours out fresh synovial fluid and delays recovery; thirdly, and most important, under proper treatment and given adequate time the symptoms suggestive of cartilage damage may gradually disappear and no operation be necessary. In other words, many of the signs and symptoms which are reliable guides in the diagnosis of the chronic or recurrent internal derangement become misleading when applied to a recent, and especially to a first, injury.

A few points in *differential diagnosis* may be mentioned:—

(1) Quadriceps development. A certain amount of wasting is inevitable after an injury, but if the muscle volume and tone fail to recover as the synovitis subsides, and with continued physiotherapy, it is an indication that there is a mechanical defect and that an exploration of the knee is necessary.

(2) The ability to kick a "dead" or stationary ball. This throws a considerable strain on a knee and any persistent disability will be shown up.

(3) Antero-posterior instability. This is sometimes found after a large synovial effusion, and may disappear as the knee returns to normal. Presumably it is due to stretching rather than to rupture of the crucial ligaments, and a knee may make a complete functional recovery after an excess of antero-posterior mobility.

REHABILITATION

Rehabilitation of the professional footballer is made easier because the game is his life and his living. The practice of allowing the trainer immediately to attend injuries on the field of play has a sound psychological basis, although at the time it may upset the nerves of the one-sided spectator who is anxious for the game to go on. The use of a sponge full of cold water on the face or back of the neck is most valuable in stimulating the player not to leave the field but to carry on in the game.

Apart from operations performed in the St. David's Wing of the Royal Northern Hospital, all other treatment is carried out at the Arsenal Stadium, which provides facilities, adjoining the playing pitch, for minor surgery and for every method of rehabilitation.

TREATMENT

It is perhaps more important in the case of a professional footballer than in any other individual to appreciate and treat the emotional and psychological background of an injury. The intense publicity now given to football has made the names of leading players household words in many homes, and, apart from this, the members of a team are very conscious of the fact that their performance each week will be the subject of discussion among their supporters. In this way professional football has become a combination of sport and show business which throws upon those taking part in it the strain, not only of an athlete, but also of a film star. More than one player has expressed his anxiety about "letting down his public" in his first game after an injury.

There is also the anxiety that if the quality of his football falls off his contract may not be renewed at the end of the season. This is in some cases a very genuine anxiety, but it is the practice in the Arsenal Club to be sympathetic and patient, to give the player every chance to make a come back. In other cases, especially in men approaching the end of their football

career, there is a tendency for them to attribute to a recent injury a loss of speed or other disability with which it has no connexion.

The treatment of an injury differs in no way from that of similar conditions in other professions. In general, the principle of "making haste slowly" holds good, and when applied to knee injuries consists in giving rest and support, combined with exercises to minimize muscle wasting and to encourage movement within the painless range.

Aspiration followed by firm bandaging is essential if the effusion is large, whilst ionization and short-wave diathermy are the most efficacious forms of electrical treatment in dealing with a synovitis. Faradism should be used sparingly, and only when the patient cannot get the knack of contracting his quadriceps voluntarily. Exercises are as a rule more efficient in that they can be carried out at frequent intervals during the day. In this connexion it should be impressed upon the player that even in the early stages getting fit after a joint injury is a whole-time job. The man should never be told to go home and rest in bed until the fluid has subsided. He attends the stadium every day to meet his colleagues and have treatment. Exercises to be efficient need not be vigorous, but there should be an attempt each day to increase them in duration and power and to increase the range of movement in the affected joint.

Local anæsthesia has not been found to play a large part in the treatment of sprains. It does enable the patient to bear weight immediately, and therefore makes possible early movement with all its advantages. However, it may retard the essential element in the complete return of full function, namely, the absorption of all fluid resulting from the injury. This, combined with adequate repair of damaged structures, is essential in a man who has to be fit, not only for one game, but for a vigorous game each week with mid-week training.

In conclusion, we wish to express our thanks to Mr. T. Whittaker, M.B.E., Secretary-Manager of the Arsenal Club, and to Mr. W. Milne, D.C.M., Trainer, for their loyal cooperation during the last twenty years.

THE PREVENTION OF ATHLETIC INJURIES IN CHILDREN AND ADOLESCENTS

By AUGUSTUS THORNDIKE, M.D.

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THAT too many serious injuries occur in athletics no one can deny; that too many serious injuries occur in the athletics of childhood, so often participated in without proper supervision, is a factor worth bringing to the attention of the general practitioner and the public. Sport is participated in primarily for physical recreation and pleasure. Often, however, the aim of sport among children and adolescents has a distorted philosophy whereby loss of temper may yield to wholesale infraction of the rules of the game, and the seriousness of victory may outweigh the aim of victory. One must, however, confine these statements to those strictly applicable to amateur sport, in order that a clear and concise conception of the points to be emphasized may be made.

From the injury incidence point of view, amateur sports for children and adolescents are considered to be of two main types: those with body contact, and those without. In the former type of sports there exists the factor of injury from external force or violence of contact with an opponent, in addition to the force that can produce injury by contact with the ground or floor. Therefore a higher incidence of injury might be anticipated in the body-contact sport. The need for better coaching and medical supervision during the playing of contact sports, particularly with children, cannot be emphasized too strongly.

To present a clear conception of the common sports in each category, the following list is given:—

Contact Sports	Non-Contact Sports
Football and Rugby	Tennis and Golf
Basketball and Soccer	Rowing and Cricket
Wrestling and Boxing	Baseball and Swimming
Ice Hockey and Lacrosse	Track and Field Running
	Fencing

GENERAL PREVENTIVE MEASURES

In attempting to limit the number of injuries sustained in sports, the most important factor is to determine that all participants are physically fit for the physical activity required in the selected sport. A *complete physical examination* by the medical practitioner is the first step to be undertaken before a child or adolescent reports for play with an organized sports team.

The medical examination should include a complete history concerning past serious illnesses and injuries, as well as examination of the eyesight, hearing, heart, lungs, circulatory system and excretory system. The respiratory and muscular systems and central nervous system should all be appraised to determine that no abnormal condition exists. Whenever the sport, game or practice involves strenuous activity of even a few seconds of extreme physical exertion, the doctor should provide medical evidence that the individual is physiologically sound, exhibiting normal cardio-respiratory, muscular and central nervous systems, capable of being trained to perform under physical stress with the greatest physiological efficiency, so that the maximum physical output can be produced with a minimum of effort.

In appraising the effort required for a particular sport, it is well to consider the physical effort necessary to produce the required basal metabolic rate. The sprinter utilizes a metabolic rate twenty times the basal rate for 10 seconds in 100 yards or for 21 seconds in 220 yards. Most surgeons who have experience with athletic teams are familiar with the classical studies of Lindhard (1915), in which it has been demonstrated that the cardiac output and oxygen requirement of the trained athlete respond to the production of physical effort with much greater physiological response of the circulatory system than in the untrained individual. This system represents the keystone in the arch of success in the well-trained athlete.

Furthermore, the prevention of injury depends upon the training of skills in the various techniques of the particular sport rather than upon actually good physical training. High quality of coaching aids materially in the reduction of the incidence of injury. Practice periods in fundamentals and in team play are essential in any injury-prevention programme.

Fundamental factors to be considered in any attempt to reduce the incidence of injuries in sport are the past medical record, the present physical training programme, and the coaching skill. Realizing that the British attitude towards amateur sports and coaching is less formal than is considered necessary in the United States, I believe that much can be accomplished by self-training, particularly in the track and field. There is no more outstanding example of success in this method than was demonstrated last June when Oxford-Cambridge was victorious over Harvard-Yale at Cambridge, Massachusetts.

As adjuncts to these three fundamental factors of injury prevention, there exist aids in the form of *padding* or *protective guards* which may be placed over exposed areas in contact sports to limit and spread the force of external violence. The football player in the United States is regulated in the size and shape of his pads. The average college player's protective equipment weighs $8\frac{3}{4}$ pounds (4 kg.) exclusive of jersey, pants, stockings and shoes. Contrast this with the British "rugger" player who carries no protective equipment. Both games have body contact but differ radically as to type of

violence of contact. Therefore padding equipment is designed for special types of sports and cannot be claimed as essential to prevent injury in all sports.

PREVENTION OF SPRAINS AND STRAINS

Prevention of joint ligament sprains and tendon or muscle strains in all sports that require sudden twisting or pivoting is possible of accomplishment. The ankle wrap described by Quigley and Cox (1946) is of great

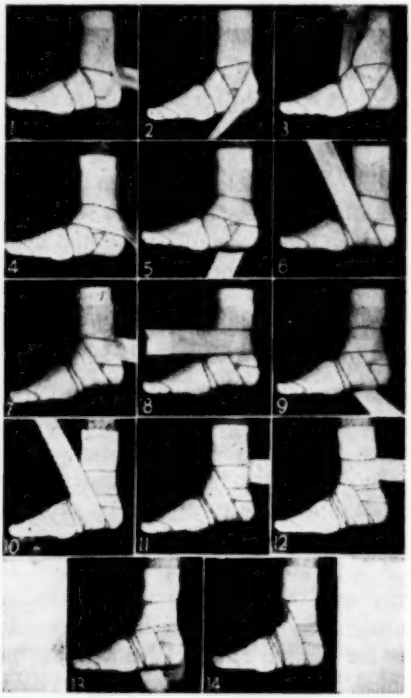

FIG. 1.—Ankle wrap of 2-inch cotton webbing 70 inches in length is wound on to the foot and ankle in fourteen turns, providing moderate limitation of twisting or unduly exaggerated stress to the tibio-fibular, medial-collateral and lateral-collateral ligaments (Quigley and Cox, 1946).

assistance in the prevention of sprains to that joint. When properly applied, this cotton webbing wrapping applied over the woollen sock provides support to the tibio-fibular ligament and to the lateral-collateral and medial-collateral ligaments (fig. 1). Similarly, the ace bandage reinforced by adhesive plaster figure-of-eight on the flexed elbow when applied in 90° flexion

will protect against hyperextension sprains (fig. 2). The bugbear of athletic injuries is the recurrent sprain, commonly in the ankle or knee. The more commonly sprained joints or strained muscles and tendons are represented

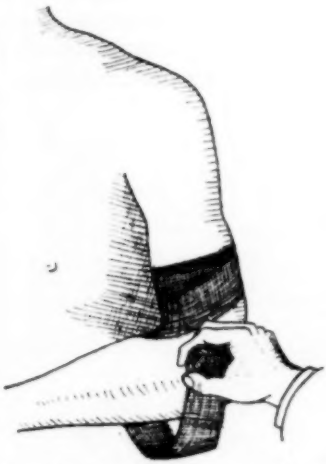

FIG. 2a.—Ace bandage 3 inches in width is applied in figure-of-eight to 90° flexed elbow (Thorndike, 1948).

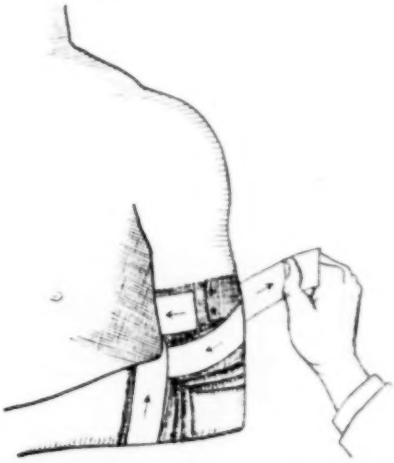

FIG. 2b.—Adhesive plaster in 2-inch width reinforces the ace bandage. This limits hyperextension.

in the following tabulations assembled from fifteen years' record of athletic injuries at Harvard College (Thorndike, 1948):—

TABLE 1

Total number of athletes in organized sports ..	14,905
Total number of sprains	1,272
Total number of strains	746

TABLE 2

Among the sprains, the ankle and knee represent 80 per cent. of the total (the shoulder represents an additional 11 per cent.).

Ankle sprains	585
Knee sprains	423
Total	1,008

TABLE 3

Among the strains of muscle or tendon, the regions of the thigh and groin represent 65 per cent. of the total (the lower leg and back represent an additional 20 per cent.).

Thigh strains	254
Groin strains	230
Total	484

RECURRENT INJURIES

When it is realized that the pathology of sprains and strains is that of a partial rupture of highly specialized tissue structures, accompanied by hæmorrhage from rupture of capillaries in the tissues themselves or in the areolar tissue surrounding the ligament or tendon, and that repair results in healing by fibrous scar tissue, it may readily be comprehended that this fibrous scar remains as a weak "link" in the specialized supportive structures.

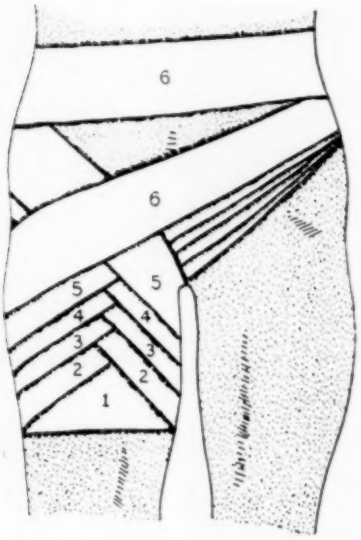

FIG. 3a.—Front view of spica bandage, using 4-inch ace bandage, applied in 30° hip flexion (Thorndike, 1948).

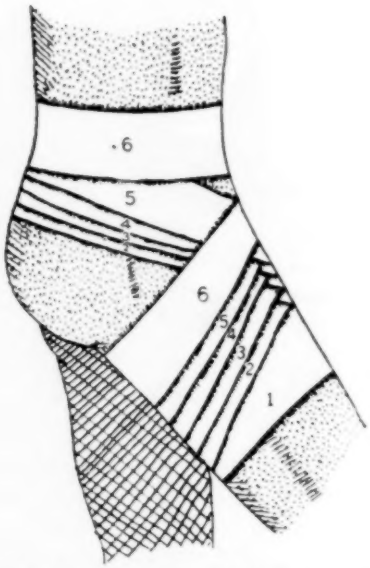

FIG. 3b.—Lateral view of spica to prevent hyperextension of psoas muscle "pulls" or strains (Thorndike, 1948).

Therefore the scarred joint ligament, the scarred muscle or tendon remains as a potential weak spot, to be more likely to rupture with less strain than normal tissue. Hence the need for protective strapping to support such scarred tissues when participation in athletics is to be resumed, or thereafter forever. The dictum of "once a sprain or strain, always a sprain or strain", has repeatedly been proven.

Protective strappings for the protection of all previously sprained joints have been devised. A few of these in the more common joints and regional areas are illustrated in fig. 2, 3, 4, 5, 6. To rely solely on protective strapping with adhesive plaster applied before each practice session or game is insufficient to guarantee the protection required. In addition, muscle tone must be restored to the muscles about the injured and scarred tissue. Particularly is this applicable in the ankle- and knee-joint sprains. A reliable

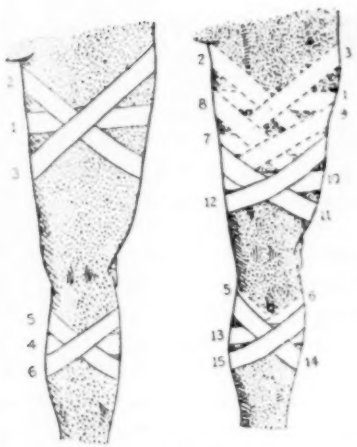

FIG. 4a.—Wandel strapping for pulled hamstring muscle. Adhesive tape 2 inches in width.

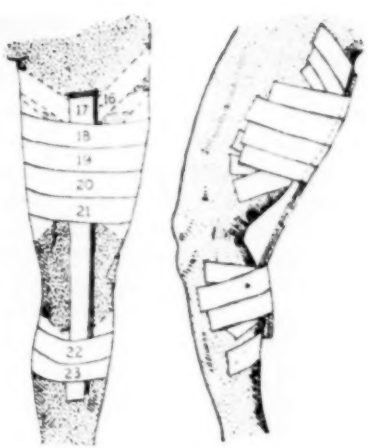

FIG. 4b.—Completed Wandel strapping applied with 15° flexion.

FIG. 5.—Ankle strapping using 1-inch Gibney basket weave strapping as the base and 2-inch reinforcing adhesive plaster (Thorndike, 1948).

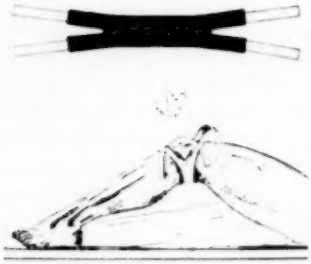

FIG. 6a.—The Duke Simpson adhesive strapping for knees. Application of the felt sling in the popliteal space.

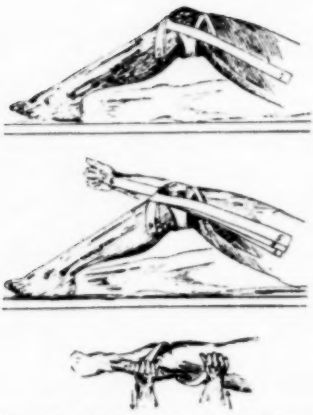

FIG. 6b.—Application of alternate longitudinal straps.

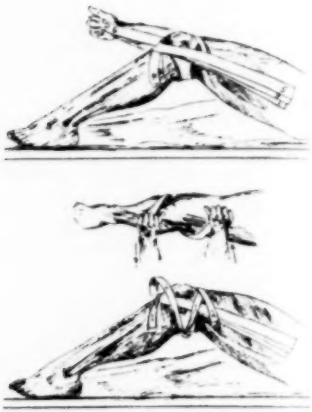

FIG. 6c.—Reinforced support to the sling and longitudinal straps.

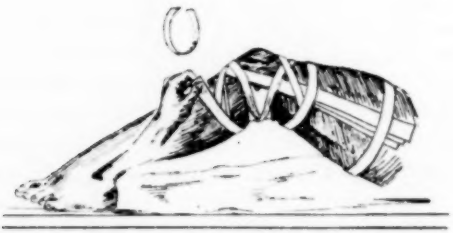

FIG. 6d.—Anchors of adhesive on the thigh and leg in three-quarter encirclement (Thorndike, 1948).

set of remedial exercises has been published (Fauver, Thorndike and Raycroft, 1933) which aids materially in maintaining good muscle tone about these joints.

Insufficient importance has been placed upon the incidence of recurrent injury. Those with athletic injuries in the late stages of recovery are sometimes permitted to resume play too soon. There should be cardinal rules to control this situation in organized sports. Before submitting an injured joint or muscle or tendon to stress or strain, muscle tone and function should be normal. If injury is in the lower extremity, the individual should be able to run without pain and without a limp in an alternate figure-of-eight course at good speed. In children, to permit a player with a sprained ankle or knee to return to full participation in a game of the calibre of Association football before a three weeks' interval, in spite of normal functional test, will invite recurrent injury. Players under nineteen years of age and during the period of rapid physical growth must be safeguarded from the possibility of developing chronic recurrent injuries in athletics.

CONCLUSION

In the prevention of injury in athletic sports, emphasis must be laid upon a high standard of medical supervision in organized team play, particularly in those sports with body contact. The doctor in charge should determine, by physical examination and medical history, (1) that each individual participant be physically fit to perform the maximum physical effort required; (2) that any player with a medical history of previous sprain or strain be required and be afforded remedial exercise to restore normal function and adequate protective strapping while at a game or practice session; and (3) that children during the period of rapid physical growth be afforded a longer period of convalescence.

Figures 2-6 are reproduced from my book "Athletic Injuries" by kind permission of the publishers, Messrs. Lea & Febiger.

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SPRAINS AND DISLOCATIONS

By JOHN CHARNLEY, M.B., F.R.C.S.

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SPRAINS and dislocations are respectively the minimum and the maximum injuries which a joint can sustain short of a fracture of one of the constituent bones. Between the two extremes, i.e. sprains where ligaments are stretched but not ruptured and dislocation where practically all ligaments are ruptured, is the important group in which there is a rupture of an isolated ligament. The failure to recognize this type of injury, and to mistake it for a sprain, may result in permanent instability of the joint or even the sequel of recurrent subluxation.

SPRAINS

When seen within a few hours of injury the diagnosis of a sprain is simple, because at this time it is possible to locate the site of maximum tenderness accurately over a ligament and not over bone; but if first seen some days after the injury, diagnosis is often difficult, because in these cases the joint may then be diffusely tender and swollen and present the appearance of a "traumatic synovitis". Opportunities for direct observation of the sprained ligaments rarely present themselves, and therefore we presume that in a sprain the ligament is stretched or so pulled out with the interdigitating fibres that there is no visible loss of continuity. Provided that these injuries are true sprains, i.e., not complete ruptures of the ligament, spontaneous recovery is the rule and, in the case of the ankle or knee, full function will return within three to six weeks; indeed, if full function has not returned by this time some other injury, such as an internal derangement of the joint, must have been sustained.

With an injury possessing such strong powers of spontaneous recovery the rôle of the surgeon is directed to reducing the duration of disability to the absolute minimum, or even to eliminating any disability and keeping the patient at full activities while the lesion is healing.

Rationale of treatment.—The ideal treatment of a sprain should start from the moment the injury is sustained, and combine the immediate application of local pressure to the injured site with early resumption of activity.

The application of *local pressure* within a few minutes of the injury is necessary to prevent the accumulation of a hæmatoma. The speed at which a localized swelling the size of a hen's egg can appear over the external lateral ligament of *the ankle* makes it obvious that arterial blood is escaping into the tissues under pressure, and at operation on this type of case a solid black blood clot will be found. An important factor which delays the recovery of function in a simple sprain of the ankle is probably this solid clot of blood, which will take ten to fourteen days to absorb. It will thus be seen that the immediate application of local pressure to a sprain is a prophylactic measure and depends upon the prompt action of the patient's comrades,

and in this respect the surgeon can be of no assistance.

If an ankle sprain occurs away from civilization the boot should not be removed immediately to make an examination. This is quite an important point on a skiing holiday because many skiing sprains of the ankle will recover within three days if the patient keeps the ankle in use, and the only disability experienced beyond this time may be a twinge of pain when doing "kick-turns".

In encouraging *early movement* of a sprain the dressing should be designed so as to check movement in the plane which caused the injury but to leave free the normal arc of movement. This is easily done in the ankle by arranging the turns of adhesive to hold the joint in eversion.

In the case of sprains of the medial collateral ligament of *the knee* the same principles apply, but in the knee the best pressure dressing is the "Robert Jones' bandage", which consists of three layers of wool and three flannel or domette bandages. These three layers are applied with successively increasing pressure until a thickness of about 2″ of compressed dressing is achieved, extending from the mid-calf below to the mid-thigh above. This massive dressing gives the knee considerable support, yet it permits 5-10° of flexion range. For the knee this dressing is infinitely better than "elastoplast", because adhesive dressings constrict the popliteal vessels when the joint swells, and then the whole leg and ankle may become œdematous and the knee intensely painful.

About ten years ago there was great enthusiasm for *injecting local anæsthetic* into sprains and then starting early function. This was based on theoretical arguments of Leriche and Policard which postulated a vicious circle of pain and vascular spasm which was broken by anæsthesia. Sprains vary so much in the duration of their disability that it is impossible to say whether this method really produces any material saving of rehabilitation time. In some cases the pain which develops after the anæsthesia has passed off is much worse than the original pain, and for this reason oily solutions such as "proctocaine" are not recommended. Whatever the success of the injection the general idea of promoting early function is highly commendable, and is probably the most important factor in the method. Similar ideas, such as local freezing of the injured area with the ethyl chloride spray, have no special advantages, and again are probably dependent for their success upon early movement.

With this emphasis on the application of local pressure and early movement in the treatment of sprains it is obvious that the application of plaster of Paris is not looked on with favour. Plaster of Paris cannot maintain the local pressure necessary to accelerate resolution, as the capacity of the plaster fits the joint at its maximum size and all pressure is lost as soon as natural absorption begins.

SPRAIN-FRACTURES

In routine X-rays of *sprained ankles* a number of chip fractures will be seen

in which a collateral ligament has avulsed a flake of cortical bone. These cases should be treated without reference to the bony damage and will recover their function at the same rate as a simple sprain. In the case of the medial collateral ligament of the knee some ectopic ossification may be seen some weeks later, and in a few cases this may be the site of genuine pain, although in the majority of cases this ectopic ossification is symptomless. Nothing can be done to prevent this ossification, but its resolution by natural processes can sometimes be made more tolerable for the patient by short-wave diathermy. Local excision of the ectopic bone has, in my own experience, been a disappointing procedure.

As regards the treatment of *sprains of the knee* I am rather critical of two therapeutic procedures which are widely practised in some clinics; namely, the routine aspiration of effusions and the application of plaster of Paris. If a knee effusion is aspirated, and if blood-stained fluid is successfully withdrawn, this means that the hæmarthrosis has been sufficiently diluted with synovial fluid to render it incapable of clotting, and therefore under the gentle continuous pressure of a "Robert Jones' bandage" the effusion is capable of absorbing itself spontaneously in ten to fourteen days. If the blood has clotted, as part of a massive hæmarthrosis, then aspiration will be unsuccessful and plastering the knee will not aid absorption so well as the continuous pressure of a flexible dressing. Condemnation of the glib use of plaster of Paris for minor injuries of the knee even extends to the treatment of undisplaced fractures of the patella; treated by pressure bandage and early movement, stellate fractures of the patella can be fit for almost full use in four weeks, whereas treated in plaster they will only just be finishing the period of immobilization at this stage.

In all knee injuries the importance of quadriceps exercises throughout all stages of treatment should be insisted upon, and happily this teaching is now so universally ingrained that no further words are needed.

Before leaving the topic of "sprains" the reader will perhaps excuse a special reference to the *wrist joint* which has common and important medico-legal repercussions. It should be an axiom that there is no such thing as a "sprain of the wrist" until it has been proved negative for a fracture of the carpal scaphoid. If the X-ray shows no fracture and the patient still has maximal tenderness over the "anatomical snuff box" a plaster cast should be applied for fourteen days and another X-ray then taken.

COMPLETE TEARS OF LIGAMENTS

It is sometimes impossible to tell clinically whether an injury is merely a sprain or is actually a complete tear of a ligament. This difficulty occurs when spasm of the associated muscles is so great that the joint appears to be stable clinically. For this reason there are some enthusiasts who advocate the routine examination of knees and ankles under general anæsthesia, but this rather mechanical approach tends to obscure some important clinical facts.

In the case of the ankle the *extent of the swelling* should make the surgeon

suspect a complete rupture of the lateral ligament or a separation of the lower tibio-fibular syndesmosis. The type of ankle which is most to be suspected is that which at first is considered clinically to be a Pott's fracture but which turns out to be normal radiologically. These cases are well worth examining by X-ray with the foot inverted.

In the knee it is usually easy to detect a rupture of the medial collateral ligament on clinical examination without anæsthesia. Under anæsthesia, however, the extent of the rupture may be considerably greater than was suspected in the conscious patient, and an X-ray taken in the position of maximum displacement is a very important record and may have a decisive bearing on whether to adopt a surgical exposure of the ligament.

CLINICAL EXAMPLES

Injuries of interphalangeal joints of the *fingers* are encountered frequently in sport and often give rise to considerable anxiety for the patient. The proximal interphalangeal joint is often the site of a spindle-shaped swelling which persists for many months, and in these cases the complete normality of the X-ray often seems out of keeping with the clinical appearance. No rigid splintage is recommended for this condition; a flexible pressure dressing such as "elastoplast" is preferable; this allows of early movement within the limits tolerated by the patient. Wax baths and exercise may be required for many months to maintain the patient's confidence, but eventually a perfect result should be attained, although it may take as long as one year.

The ankle.—It is the accepted modern teaching that a complete rupture of the lateral ligament of the ankle, as shown by tilting of the talus in the X-ray, should be fixed in plaster for four weeks (although one cannot help feeling that these ligaments will heal without fixation if the ends are not grossly separated, whereas they will fail to heal if grossly separated, even if fixed in plaster). But in the present state of knowledge it is necessary to give the patient the benefit of the doubt and apply a plaster for four weeks.

The knee.—In the young athlete a complete rupture of the medial collateral ligament of the knee should be explored surgically with the minimum delay. Through an incision in the length of the ligament a clot will be discovered, and on evacuating this the frayed-out ends of the ligament will be found. In some cases the torn ends will be turned inside the joint, the cavity of which will be exposed through a gaping hole in the capsule. The ends of the ligament should be placed against each other, but it is unnecessary to attempt an accurate suture, and a single anchoring stitch of fine catgut is all that is required. Before suturing the superjacent tissues the position of the knee which relaxes the ligament should be discovered—this will be at about 30° of flexion from the fully extended position. A plaster will be needed for four weeks in this flexed position.

In exploring the medial collateral ligament of the knee it is important that it should be done as an emergency; if over ten days old there is no

advantage gained by operation, because by then the ligament is swollen and stiff, and its limits are difficult to define. If one end of the ligament in this state has been turned inwards as a flap it will be quite impossible to turn it out, and therefore a gap will still remain at the end of the operation. It must be remembered, however, that without operation on the medial collateral ligament of the knee the joint is always capable of spontaneous recovery. I once observed a case in which the skin on the inner side of the knee showed a transverse groove where it was sucked into the joint line, thus indicating a complete tear of the medial collateral ligament and capsule—yet this case recovered completely without operation.

The disability which results from a complete tear of the medial collateral ligament of the knee varies considerably. In civil life persistent disability from this cause is uncommon, and this fact gives substance to the belief that the stability of the knee is primarily dependent upon the tone of the quadriceps muscle. Under conditions of active military service, on the other hand, many cases of gross instability of the knee were encountered which seemed to defy all attempts at rehabilitation of the quadriceps muscle.

DISLOCATION OF THE SHOULDER

Subcoracoid dislocation is by far the most common dislocation of the shoulder, and although treatment of this injury is generally of the utmost simplicity it can be complicated by paralysis of the deltoid muscle, fracture of the greater tuberosity, injury to the brachial plexus and recurrent dislocation of the joint.

Reduction of the dislocated shoulder is usually secured by one or other of the methods of Kocher or Hippocrates. It would seem that Kocher's method is more generally preferred and that the Hippocratic method is only attempted when the Kocher has failed. This is regrettable because Kocher's method (as was pointed out by Böhler) is more traumatic than the Hippocratic method and is capable of increasing the rupture of the subscapularis. *Kocher's method* was originally devised to reduce the dislocation without anæsthesia, the slowly carried out initial stage of external rotation being needed to overcome spasm; but nowadays there are no reasons for reducing dislocations without anæsthesia.

In performing the *Hippocratic method* the head of the humerus should be drawn down to the level of the tear in the capsule by traction on the arm and, maintaining traction, the limb should be gently rotated internally and externally. If reduction does not immediately occur then the patient's arm should be adducted so that the surgeon's foot (in the patient's axilla) acts as a fulcrum against which to lever the head outwards. In this position the rotations should be repeated until reduction occurs. The reduced shoulder should be rested in an inside sling for one week and an outside sling for a further two weeks.

If the greater tuberosity is fractured it should be ignored unless the fragment is so large that it invites open operation and internal fixation. On

no account should a dislocated shoulder be treated on an abduction frame during the first three weeks (even if complicated by a deltoid paralysis), lest the complication of recurrent dislocation is invited.

DISLOCATIONS OF THE ACROMIO-CLAVICULAR JOINT

Complete dislocation of the acromio-clavicular joint indicates a complete rupture of the coracoid and trapezoid ligaments holding the clavicle down to the base of the coracoid process. Complete dislocations can be treated by pressure pads and strapping, but the method needs daily observation by the surgeon and frequent X-ray check. It is preferable in these cases to perform the Bosworth operation and screw the clavicle down to the coracoid for two or three months and then remove the screw.

In subluxations of the acromio-clavicular joint, chronic shoulder-tip pain would appear to be more frequent than after complete dislocation, although subluxation is, of course, a much commoner injury. They should be treated from the start by early movement, using a sling to take off the weight of the arm. Painful acromio-clavicular joints, if they develop evidence of traumatic arthritis, can be relieved by excision of the outer $\frac{3}{4}$" of the clavicle, with gratifying results.

DISLOCATION OF THE ELBOW

The elbow often becomes remarkably stiff after dislocation and may take many months to recover a useful range, and indeed may never recover its original amount.

The tendency for extension of the elbow to be lost follows many comparatively minor injuries of the elbow joint and is often seen after simple crack fractures of the head of the radius. The complication of myositis ossificans in the brachialis anticus is perhaps the most well-known cause of severe stiffness of the elbow after dislocation, but in practice it is not a very common complication. It is much more likely that the common cause of elbow stiffness after dislocation lies in the lateral ligaments of the joint, and indeed it is often possible to diagnose a past history of dislocation in a stiff elbow joint if flakes of ectopic bone over the medial and lateral epicondyles are visible in the X-ray. In stiff elbows when dislocations have been complicated by fracture of the head of the radius there is often considerable new bone formation, but this always appears to take place in the capsule anterior to the head of the radius and never in the muscle of the brachialis anticus, as would be the case in true myositis ossificans.

Because of the danger of increasing ectopic bone formation in myositis ossificans, it has become the general practice to recommend rest for the elbow joint after most injuries at this site. For this reason stretching and passive exercises have been strongly condemned. Except when myositis ossificans is present there is no point in enforcing rest by means of plaster fixation, and a simple sling affords all the fixation that is required.

THE BROKEN COLLAR BONE

By LESLIE MORRIS, M.D., F.R.C.S.

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A FRACTURE of the clavicle is a common athletic injury. As a rule it results from indirect violence, either due to a fall on the outstretched hand in children or to a fall on the tip of the shoulder in older people. Occasionally it results from direct violence due to a kick at football or when a motor cyclist is thrown against a telegraph pole.

The common site of fracture is in the middle third of the bone, just beyond the centre. Occasionally it is at the inner or outer end. A fracture of the midshaft of the clavicle is invariably simple, with displacement. It may be comminuted, in which case a small loose fragment is present between the main fragments. In children the fracture may occur without displacement and may be of the greenstick type. When a fracture occurs with displacement, the outer fragment falls downwards, forwards and inwards because of the weight of the arm; the inner fragment remains in position or is elevated slightly by the pull of the sternomastoid muscle. When a fracture occurs at the inner or outer end of the bone there is rarely any displacement. The degree of displacement depends upon the extent and type of violence. When resulting from a fall on the outstretched hand it is less marked than when it follows a fall on to the tip of the shoulder, a fall from height, at speed, or from a horse, or by a direct blow. Direct violence may produce irregular displacement, the soft tissues may be caught between the bone ends, and bony union does not occur. Unusually severe violence with depression as well as impaction of the tip of the shoulder may sometimes lead to injury of the brachial plexus. When this is incomplete only the upper cord is involved, and the paralysis of the deltoid muscle which occurs may easily be overlooked.

DIAGNOSIS

In a typical case there is always pain, shock and inability to move the injured arm, the patient tilts the head to the affected side, and holds the elbow with the other hand to prevent movement (fig. 1). The site of injury is tender, there is swelling, and the displaced bony fragments can readily be palpated. There can be no doubt about the fracture of the midshaft of the clavicle. When the bone is injured at the inner or outer end there may be some difficulty; there is, however, a history of fall, pain, incapacity and local tenderness. The diagnosis is confirmed by X-ray examination, and in a doubtful case both antero-posterior and oblique views should be taken. In children a greenstick fracture occurs: it causes little disability, and may

not be seen in a straight X-ray. The diagnosis is overlooked until swelling due to callus appears a few days later.

Differential diagnosis.—A fracture of the outer end of the clavicle simulates the more common acromio-clavicular dislocation. A fracture of the inner end of the clavicle must be differentiated from a sterno-clavicular dislocation. Associated injuries to the brachial plexus, scapula, humerus and ribs should be looked for if the accident has been a serious one.

FIG. 1.—Boy with fracture of right clavicle. Note characteristic stance of patient, with head tilted to affected side, and elbow on affected side supported by other hand.

TREATMENT

It is essential to devise some sort of support for the shoulder girdle which does not immobilize the arm and so lead to stiffness of the shoulder and wrist joints. When the patient has been examined he should be allowed to lie on a couch while awaiting attention. This relieves pain, and the fragments fall into better position. When pain is severe and there is marked displacement the hæmatoma around the site of fracture should be injected with 5 ml. of 1 per cent. novocaine before reduction and fixation is attempted. In this way it is possible to reduce the fracture painlessly, and the patient, being conscious, can sit up afterwards while his bandage is applied.

The most useful method of fixation is by means of a figure-of-eight bandage. This may be applied successfully in various ways. I recommend a "sausage" bandage. This consists of a domette bandage some 4″ to 5″ wide which is threaded through two cylinders made of double gamgee, folded or rolled and then stitched into the form of a cylinder or sausage-shaped pad some 6″ in length. A piece of adhesive felt is placed over the site of fracture and is strapped firmly into place (fig. 2). The bandage is applied first across the front of the fracture and under the axilla where the first pad falls into place. The bandage is then wound across the back, around the front of the normal shoulder, under the axilla where the second pad fits. Afterwards some four or five circuits of the bandage are made. Each time the bandage is carefully placed over the pad, and tension is exerted in an upward and backward direction (fig. 3). Care must be taken so that the bandage does

Fig. 2

Fig. 3

Fig. 4

TREATMENT OF FRACTURE OF THE CLAVICLE

Figs. 2 and 3.— Pad and strapping have been applied. Two stages in application of "sausage" figure-of-eight bandage illustrated.

Fig. 4. — Bandage has been applied. Note injured shoulder now elevated and head straight.

not slip to one side, in which case it becomes too tight or too loose. If applied too tightly, œdema of the arm occurs and leads to stiffness of the hand and wrist.

The patient feels benefit from this bandage at once, and although correctly applied he may suggest that it feels tight and that he feels a little numbness down the arm. In this case he should lie down for a time. He is then given a sling to wear for two to three days. The bandage is readjusted occasionally when necessary. After two or three days the patient is instructed how to use the shoulder, elbow and hand freely and he may wear his clothes and coat in the normal way. If he does cooperate there will be no need for special remedial treatment afterwards. The bandage is kept in place for three to four weeks, and the indication for its removal is when there is free movement of the arm and shoulder without pain. Activity and games are resumed six weeks after injury, except in special circumstances.

X-ray control of the fracture is not necessary. It is unusual to reduce a fracture perfectly, and although in the course of time a considerable amount of callus may be thrown out, this, as well as the deformity, resolves and cannot be detected. When treating a heavyweight boxer, or football goalkeeper, the surgeon should wait for bony union to occur before allowing competitive sport. This does not occur for some weeks after clinical union.

We have used this method of treatment with success for many years and I do not propose to discuss the alternative methods described elsewhere. When the patient must resume activity without delay, however, and is prepared to suffer some discomfort, he may be permitted to do so if a pad of adhesive felt is placed over the fracture and is strapped firmly down to the chest. For a few days only a leather strap passed round the arm to the chest wall may be worn.

A fracture of the *inner end of the clavicle* needs little treatment beyond a sling which is worn for ten days. A fracture of the *outer end of the clavicle* requires the same support as used in the treatment of an acromio-clavicular subluxation. This consists of a pad of adhesive felt applied over the site of injury and another under the proximal end of the ulna. The shoulder is elevated by lifting the elbow and 2″-strapping is then applied, starting in front of the chest, over the site of injury, down the arm, under the elbow, again across the site of injury and down the back. After application of the strapping, reinforcement is given by means of an Elastoplast bandage applied in a similar way. Care must be taken to prevent a pressure sore under the elbow, and in the early stages readjustment may be necessary. After the arm has been strapped, movement of the shoulder and hand is encouraged. The strapping is retained for three weeks, and then activity is allowed from a sling.

A fracture of the clavicle, when treated in the ways outlined, invariably unites clinically within six weeks, and there should be no pain or stiffness of any of the joints of the arm. The patient is warned that there will be a

swelling due to the formation of callus, and that, in time, the swelling and deformity will disappear. The small loose fragment which may project in a comminuted fracture causes anxiety; it should not be removed by operation because it invariably disappears.

FIBROUS UNION

Although a good clinical result is obtained after six weeks, and activity is allowed, it is sometimes later before bony union takes place, and I mention again that in the case of a boxer, football goalkeeper, or racing jockey, a surgeon should wait for bony union to occur before allowing competitive sport. Occasionally, and following injury by direct violence, bony union does not occur. The bone is united clinically by fibrous union, the patient is able to undertake moderate activity, but when he resumes full activity and falls, the fibrous union gives way and he is said to break his clavicle a second or third time. In such cases, if he must undertake competitive sport, it is necessary to operate. There are practically no other indications for operation on the clavicle.

Operation.—The clavicle is subcutaneous and is easily explored by a collar incision ½" above the bone. The bone ends are identified and freshened, and soft tissues removed from between the fragments. It is possible that this is all that is required if the fracture is treated in the normal way afterwards. The fragments, however, are found to be displaced and mobile, and the surgeon is tempted to fix them. Whereas a bone graft seems to be the method of choice it is possible to fix the fragments with success by using a plate and short screws. The plate is placed on the anterior surface of the bone and in a month's time is removed through two small ½"-incisions centred over the screws. In this way the bone unites readily in perfect position and full function is regained.

SUMMARY

A comfortable support which allows free use of the shoulder, elbow and hand is more important than more rigid fixation.

Moderate displacement of the fragments and early swelling from callus will disappear if left alone.

Injury from a fall on to the tip of the shoulder occurs as frequently as a fall on the outstretched hand, and in a serious fall associated injuries should be looked for.

Injury from direct violence may lead to fibrous union and when strenuous activity is undertaken afterwards there is early refracture; only in these cases is operation called for.

DENTAL INJURIES IN ATHLETICS

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INJURIES to the teeth are primarily the concern of the dentist, but since they are often associated with trauma of neighbouring structures—the nose and the lips—the patient is often seen first by the family or the school doctor. Preoccupied with these other things he may fail to notice or to appreciate the importance of the dental injuries, so that their treatment is delayed.

THE IMPORTANCE OF EARLY TREATMENT

It cannot be urged too strongly that, for reasons which will appear, any delay in such treatment by the dentist, even a delay of a day or two, may be fatal to the tooth and bring about its early loss. As in 90 per cent. of cases the tooth involved is an upper incisor, and a prominent one at that, its loss is a serious disfigurement; more of a handicap no doubt to the career of a girl than of a boy, but not without importance to the latter. Its replacement by a dental "bridge" in gold is expensive and not always mechanically satisfactory, whilst a partial denture is all too often a potential engine of destruction and loss for the other teeth.

The most common cause of injury is a fall on to the face which brings the edge of the upper incisor teeth into sudden contact with something hard: that is why in the overwhelming majority of cases these accidents befall people with prominent upper teeth. But a blow from a ball, a hockey stick or a tennis racket, or a kick in the mouth will serve equally well, and it is accidents such as these which account for injury to the lower incisors. These accidents are most common between the ages of seven to fourteen when the teeth are not so strong or so firmly attached as they become later, and boys are more commonly injured than girls.

It should be remembered that when a permanent tooth erupts, little more than half the root is calcified and the opening at the root apex where blood vessels and nerves enter the pulp is wide open. Three to four years elapse before root calcification is completed and the apical opening becomes reduced to a fine canal. During these formative years some slight range of movement can occur without injury to the apical vessels. Later, the completed root is more tightly enclosed in a stronger bony socket lined by a thin periodontal membrane—the common periosteum which binds together the root and alveolar bone. In these new conditions a slight dislocation, if sudden, may result in rupture of the vessels entering the root apex and pro-

duce death of the pulp. These facts have an important bearing on the results of tooth injuries.

DISLOCATION OF TEETH

Dislocation of the tooth by a blow may be so slight as to escape notice. It may have been reduced by the lips, tongue or fingers of the patient before he is examined and, beyond a slight soreness of the tooth, there may be no symptoms. Nevertheless, as just explained, the pulp may have received a fatal injury from the rupture of the blood vessels. The hæmoglobin in the pulp will enter the dentinal tubules, in time staining the dentine brown or grey and producing disfigurement. Sooner or later, too, the dead pulp will become infected, either from the blood stream or more commonly by bacteria which, having gained access to the lymphatics of the tooth socket through some trauma of the gum, reach the apical pulp canal before being killed by the tissue defences. Staining or infection, both very difficult to eradicate when established, can be prevented if the dentist sees the tooth in time, discovers by appropriate tests that the pulp is dead, removes it and fills the root under aseptic conditions.

Gross dislocation is obvious: generally, although not always, the apical vessels are torn, but if the pulp is still alive, reduction of the dislocation should be slow, not sudden, lest the vessels spared by the injury should be damaged by its treatment. Teeth knocked clean out of the mouth have been successfully replanted, but their expectation of life is under ten years and the success of replantation varies inversely with the interval of time between injury and operation—the sooner the better. Pending operation the tooth should be kept in sterile saline with penicillin added until the dentist can get to work, remove the tooth pulp, fill the root, replant the tooth and splint it to its neighbour.

FRACTURES OF TEETH

Either the crowns or the roots of teeth may be fractured. In the case of the former, prognosis and treatment depend upon whether the fracture has exposed the pulp. If it has not, the fractured surface should be protected from irritation by a neutral cement for two or three months before restoration of the tooth is attempted. This will give the pulp time to shut itself off from the exposed dentinal tubules by a barrier of calcific scar tissue. Should the pulp be only slightly exposed the same treatment may save it if applied before it becomes infected. But if the exposure is a large one the pulp must usually be removed and the root filled. Exceptionally, if the fracture affects a young tooth with roots not yet fully formed, and treatment is early enough to anticipate gross infection, the coronal portion only of the pulp can be amputated, and the root portion, suitably protected, left until its task of calcification is completed. One word of warning should be given. The sensitive surface of dentine or the exposed pulp become less so if swabbed with a strong caustic, like phenol, and such treatment gives relief to the

patient; but it is likely so to injure the odontoblast cells through the dentinal tubules that it will prevent that very formation of a protective calcific barrier which it is the object of treatment to bring about. Fractures of the roots of the teeth may be suspected if they are loose and very painful, but the injury can only be diagnosed by X-rays. If the fracture is near the crown, the tooth usually cannot be saved; if near the root apex, union will sometimes occur when the pulp remains alive; if it dies, the fractured apex can be amputated and the root filled.

In all these cases it will now be clear why the chances of the injured tooth being saved by dental treatment depend mainly upon the shortness of the interval separating such treatment from the injury.

INJURIES OF THE JAW

A heavy blow in boxing has been known to produce fractures of the mandible at any of the three places where it is weakest—the neck of the condyle, the angle and the canine region. In these days of routine X-rays the diagnosis is rarely missed. If motor-cycling and flying are included in athletics, fractures of the maxilla also come into the picture. They are often impacted, the bruising of the face disguises the displacement, and skiagrams are not always revealing, so that these fractures are sometimes missed at first, although there is always a disturbance of tooth occlusion: delay in reduction of the displacement greatly increases its difficulty, since union is almost always rapid.

Perhaps a word may be permitted on the first-aid treatment of mandibular fractures; the traditional four-tailed bandage is always bad, since it increases that backward displacement of the chin which is usually present. In double fractures this displacement may be a danger to life by driving the tongue back and impeding respiration, and such patients should always be carried on a stretcher face downwards; they have been known to die if laid too long on their backs.

The best bandage for a fractured mandible is the so-called barrel bandage in which alternate turns of a roller-bandage are taken first vertically from under the chin to the top of the cranium, and then horizontally, to steady them, from the occiput round the front of the forehead. The successive vertical turns tend to press the lower teeth into correct occlusion with the uppers and thereby reduce the displacement.

Mandibular fractures are almost always compound into the mouth through a tear in the muco-periosteum covering the oral surface of the bone. They also show considerable displacement of the fragments from the pull of the powerful muscles of mastication, and this upsets the occlusion of the teeth. Reduction of this displacement and retention of the fragments in their correct position can only be effected by the dentist, and his aid is also needed in controlling infection at the line of fractures if the risk of non-union of the bone is to be reduced.

ATHLETICS AND THE HEART

By TERENCE EAST, D.M., F.R.C.P.

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In discussing this question it will be assumed that the heart is apparently free from signs of disease. Should disease be present, and routine examination detect it, suitable restrictions in activity will, of course, be imposed. It is surprising how some young people, in spite of valvular defects, are able to carry out quite strenuous athletic pursuits, all in ignorance; such is the reserve power of the myocardium. But sooner or later symptoms develop and the defect is discovered. Routine examination at school should have prevented this unfortunate occurrence. But it often happens that children with heart lesions, who leave school at fifteen, get no further advice and do too much later on. In this article the effect of athletics on the heart at various ages will be considered. Age and growth are two variable matters which need to be taken into account, and there is also a third which concerns the nature of the sport indulged in.

HEART STRAIN

Before going into details the often posed question may be asked once more: can a healthy heart ever be "strained"? In attempting to answer this it is first necessary to consider what the word "strain" really means. In the past, anatomical and physiological considerations have entered in and, indeed, the word is vague in its meaning. Formerly it has been supposed that the heart might become dilated owing to stretching of the muscle fibres, and that, in consequence, signs of enlargement might appear; and this increase in size might lead to incompetence of the mitral valve, producing a systolic murmur at the apex. From the physiological angle the "strain" might be manifested by undue tachycardia, fatigue, and breathlessness on exertion; by a diminished exercise tolerance, by the appearance, in fact, of what has been called "the effort syndrome".

It is my belief that in a healthy heart anatomical changes are not produced by athletics, and I would quote the words of Sir Thomas Lewis: "The burdens imposed by physiological acts upon the heart, however heavy those burdens may be, never exhaust the heart's reserve". The physiological symptoms of the effort syndrome are related to the body and mind as a whole, rather than to the heart in particular.

Boys at school.—It is only too obvious that boys at school vary enormously in their capacity for athletics. Some may have the physique and the capacity for using it; others are not so inclined. Some have poor physique—often the frame outgrows the muscles; they are awkward and clumsy in movement. Some have stamina and pluck which will drive them to the last gasp—

"they can because they think they can"; others flag and give in early. In many, or indeed most, of the things they do, there is scope for the natural ability, and boys will instinctively limit themselves to their capacity. It is in certain competitive sports that care is needed. The two important things in this respect are long distance running and rowing. In almost everthing else there is always a moment for a breather, but in these two it is not so.

Young adults.—Much of what has been said of boys at school can be applied to young adults at Universities, or when they have left school. Now their choice is freer, and they know their limitations better, and are less likely to be induced to enter for sports for which they are not actually fitted. Here, however, the competitive element is likely to be keener and the standard higher. There is no doubt that the level of attainment among the most proficient experts rises progressively. Records are always being broken; training is stricter and practice more perfect. At this age, of course, physical development is more complete: the muscles are better developed, the lanky youth has "filled out" and become strong and well-knit.

Minor infections.—It may be concluded that competitive and other sports will not damage a healthy heart in the young, or at any other age. The emphasis lies on the word "healthy". In this respect I do not mean frank disease, which at this age is likely to be valvular. It is important to bear in mind the transient, but nevertheless harmful, effects of the toxin of the minor infection on the myocardium. These may be met with as the result of an infection of the throat, or some such vague illness that can only merit the designation "influenza". That myocardial changes, transient but nevertheless certain, do occur is shown by alterations in the height and direction of the T wave of the electrocardiogram. The information is not very plentiful in such cases as these, but from the occasional examples seen there can be no doubt that in all probability transient changes are more common than might be supposed. Further, it must be remembered that the myocardium may well be in a temporary state of ill-health although no abnormalities appear in the electrocardiogram. With such things as this in mind it would be wise to restrict sports, certainly competitive sports, after even such a slight illness as those mentioned above. To undertake excessive physical activity too soon during convalescence may lead to a diminished capacity for exertion and a form of effort syndrome.

THE EFFORT SYNDROME

Many symptoms may be manifested here. Briefly, it describes a poor capacity for physical effort. This may be shown by dyspnœa unduly easily provoked, by excessive and prolonged tachycardia, or by a proneness to early and undue fatigue. It is true that such reactions are apt to appear more easily in some persons than in others, and in many there is a strong element of neurosis, linked as often as not with anxiety. There is a certain lack of

stamina and pluck; to reverse Virgil's quotation, "they can't because they think they can't". Much of this is constitutional and associated with the mental make-up and physical habitus. Such boys or adolescents will avoid excessive activity instinctively. In the easy times of peace they can follow their tastes. It was nearly a century ago in the American Civil War that this unsuitability for the ardour of military service was described by da Costa; and it reappeared again in the 1914-18 war, and was extensively studied by Lewis. The practical point is that, when necessary, careful and gradual training can greatly improve these young fellows and many can be raised to a high pitch of endurance and vigour. But nothing can be made of others if their hearts are not in it. Realization of this in the 1939-45 war avoided many of the troubles due to effort syndrome, in spite of much more severe tests of endurance.

The practical point is that those who have charge of boys and young adolescents should watch that they do not attempt things beyond their strength to which keenness or the pressure of their fellows' opinion may lead them. Not that their hearts will become diseased, or "strained", but that the whole physiological reaction of the individual to exertion becomes impaired.

SCHOOL BOYS

To sum up the view concerning the activities of school boys, the sport most likely to do harm is cross-country running. In the growing adolescent I believe this were better omitted altogether. Rowing also needs careful consideration, but here the risk is less, for the faint oarsman is at least being carried along by the others and he can save himself by surreptitious "sugaring". But crews are carefully picked and undergo long periods of steady progressive training, so that such a lamentable default is seldom likely to arise. Shorter running races are rarely likely to be harmful, nor is football.

YOUNG MEN'S SPORTS

After the school age many cease athletics; only those who are keen and physically fitted will continue. The grades of achievement and the competition are correspondingly higher: the rigours of the tests are all the more severe. Perhaps the highest levels are those of the long distance races, such as the Marathon Race, or the long rowing races. It is true that the Varsity race from Putney to Mortlake is always held up as a high test for the two crews, but many crews other than those of the older Universities accomplish it with less réclame. The studies of Bramwell and Ellis years ago on Marathon runners showed that on the whole they tended to be past their first youth, that they were small men, whose hearts were on the whole rather large for their bodies. This is in keeping with the observation that any actively running animals have large hearts.

It seems evident that to reach the furthest limits of human endurance in the athletic world the heart must be sound. No one can be an athlete of any prowess unless it is. A large efficient heart is certainly an essential for anyone who would aspire to rival Pheidippides.

SPORT IN LATER LIFE

How long should a man keep up his football, running, rowing or squash rackets, or whatever he enjoys? May sport in middle age do harm? The answer to this in the vast majority of cases is a domestic one. Marriage and a young family soon shackle his limbs, and pushing the perambulator or leading a toddler will be the limit of the past quarter-miler. But this is all in the nature of things. If others wish to continue, no harm is likely to accrue; the important point is to realize when the activities cease to be a pleasure and become a pain. The unsatisfactory type of case is he who suddenly realizes that middle age and its spread is upon him and who, all too late, may seek to regain fitness by injudicious exercise. Defects may already have developed in the heart and now harm may be done. But this is not common as a rule, for as often as not such attempts to regain fitness are all part of New Year resolutions which melt with the spring. But it is safe to say that those men who keep up their fitness and do not allow themselves to deteriorate suffer no harm as the years go by, and slowly they do less as they grow older.

The after-effects.—The problem arises in retrospect. In middle life it is not infrequently asked by men who have been athletic in youth whether or not some harm may not have been done. It may be that the patient has fallen, rather early, a victim to coronary disease or to hypertension.

The athlete is of a physical habitus that in many cases tends to run to fat when he gives up his athletics for marriage and parenthood. He is probably better fed than when he was a bachelor, and his opportunities for exercise are likely to be less. Some men frankly degenerate physically in middle life, and run to seed, truly an instance in which "*Corruptio optimi pessima*". There is very little evidence that the most severe forms of athletics lead to premature cardiovascular degeneration. In years past, the longevity of the Boat Race crews has been studied, and nothing has been found to show that their expectation of life was not quite normal. There is no doubt that a thoroughly healthy and efficient heart is necessary to anyone who indulges in the severer forms of sport, and it does not suffer any harm therefrom.

THE DIAGNOSIS OF THE HEALTHY HEART

One final aspect of the matter still needs consideration. Often one meets patients in middle or later life who give the story that their hearts were strained in youth and athletics forbidden. In these days with diagnosis more accurate and appreciation of certain errors or fallacies more widespread,

such mistakes are far less likely to occur. The most usual error to be made will be the faulty interpretation of some trivial physical sign, found perhaps on routine examination. The two most common are the harmless systolic murmur and the physiological third sound. Also a nervous overaction of the heart may give the spurious impression of enlargement. But if any systolic murmur is carefully examined in the erect and recumbent postures, and its relationship to the phases of respiration noted and its place in the cardiac cycle marked, its harmless character should easily be decided. When there is any doubt at all, an expert opinion should be sought. It is a far worse mistake to label a healthy heart as diseased than to overlook the early onset of a lesion. The former error may never be corrected—such a label is very hard to get rid of—whilst in the latter case the right view is not as a rule long delayed. In the former case the adolescent may be deprived of activities essential for his proper development and suffer psychological trauma that may take a long time to heal.

Another point which nowadays does not often cause difficulty is an arrhythmia. Sinus arrhythmia in young people is usually recognized, and its enhancement by expiration, and its abolition by acceleration of the heart make it easy to diagnose. Occasionally premature beats are found; these are not common in the young and one should regard them as a hint to seek for sources of irritation or toxin outside the heart; they are almost always abolished by exercise; just occasionally they may indicate a mild rheumatic carditis which has been overlooked.

The exercise tolerance test.—This test has a certain value if carried out in a standard way. The principle is to find out what the response of the heart is to exertion. The rate of the heart should first of all be noted, recumbent and then standing. When it has steadied, the subject should mount a low chair some twelve to twenty times in the course of a minute. The heart rate is then recorded, a mental note being made every quarter minute; it is not difficult to carry four or five figures in one's head, and usually it is found that the initial acceleration rapidly changes in the third quarter; at the end of a minute, in the normal person, the rate is much the same as the standing rate. If the rapid beating is prolonged, it is an indication of a poor response.

It is just as important to notice the development of dyspnœa, and this, too, should be recorded. In a healthy young adult the increase in breathing is almost negligible. If there is a nervous tachycardia at the onset, exercise will often reduce it to a rate nearer the normal.

Wide conclusions must not be drawn from such a test as this, but it is useful as an indication of how that particular heart responds to a particular test. The test can always be made more severe by prolonging the exercise or increasing the height of the step to be mounted.

The general demeanour of the subject is often very informative, as well as his breathing and pulse rate.

THE URGE TO PURGE

SUPERSTITION AND PRINCIPLE IN SURGERY

By V. J. KINSELLA, M.D., Ch.M., F.R.C.S., F.R.A.C.S.

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The theme which binds together the elements of this article is the management of the bowels after abdominal operations and in peritonitis.

Centuries before Hippocrates, centuries even before the sons of Æsculapius tended Ajax and Achilles, it was written in hieratic script upon the Papyrus Ebers that ileus was to be treated by active purgation. Expulsion of the evil thing would cure. In more modern times Hippocrates wrote that "all diseases are resolved by the mouth, the bowels, the bladder or some other such organ". In view of these expulsive ideas, we may well shudder at the thought of the many patients through the ages whose sufferings from peritonitis and intestinal obstruction were made more dreadful by the primitive efforts of those who sought to heal.

But help was on the way. Hippocrates himself attempted the method of establishing principles by inductive reasoning. Observation convinced him that purgation not infrequently caused harm. He often tried to distinguish the circumstances in which purgatives should be given or withheld. He describes one type of fever, coming soon after food, with pain in the side, when the patient should lie quiet and purgatives should not be given earlier than the fourth day, and the diet should be water and oxymel, later supplemented by non-residue foods. Perhaps among these patients were sufferers from appendicitis. But, on the whole, his directions were vague and often incomprehensible. Aristotle may have had him in mind when he wrote that "a man strictly and properly speaking *knows*, when the principles are known to him; for if they are not better known than the conclusion, such knowledge as he has will be merely accidental". But, as generation succeeded generation, the data for establishing principles were gradually accumulated. Anatomists laid the foundation. Contributions came from physicians and, in more recent times, physiologists, pathologists and surgeons. In Padua, Oxford, Dublin and Boston torches were lit, and the sufferer from appendicitis owes more than a cock to Vesalius, to Harvey, to Graves and Stokes and to Fitz. Through their efforts we may now "strictly and properly know". But the truth and newly born principles must still struggle to survive. They encounter a bitter opposition from the ancient superstitions. The urge to purge or to be purged has a great fundamental force, and resembles those instincts which possess man, both individual and herd, sometimes even to destruction.

THE FUNCTIONAL PATHOLOGY OF DISTENSION

The facts and the principles cannot be stated too often, and to secure their recognition it is necessary to set them out clearly; this is done, in diagram form, in figure 1.

The data contributed by the anatomists is obvious enough. The contribution of the physiologists is shown by the two sets of arrows. One set

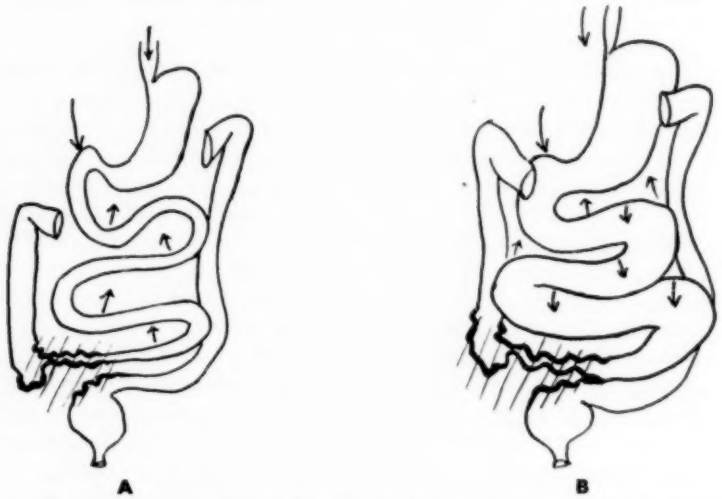

FIG. 1.—The gastro-intestinal tract after operation for acute appendicitis. Note the zones, upper, middle and lower. The middle zone is shaded. The downward pointing arrows represent fluid poured into, the upward pointing arrows fluid absorbed from, the tract. (A) With balanced exchange—adequate absorption in the upper zone. (B) With unbalanced exchange—secretion and transudation predominant in the upper zone.

points downwards and represents fluid poured into the gastro-intestinal tract, some ingested and some secreted by the liver and pancreas and other glands. Even if nothing be given by mouth, the downward pointing arrows represent a daily volume approximating 2 gallons (9 litres) of liquid containing an ounce (30 g.) of salt. But, in spite of this daily in-pouring, distension does not occur, even if the bowels remain at rest. It is apparent that absorption by the intestinal epithelium preserves the balance. Not only liquids, but also gases, are exchanged through the mucosa. Absorption is represented by the set of arrows which point upwards. The balance is a basic requirement for our existence, and it is preserved with delicate efficiency by the epithelium (fig. 1A). But there are two factors, either of which may so completely upset this balance that absorption becomes inadequate: One is the presence of irritants in the intestinal tract. The epithelium, for its own protection, responds to irritants by an increased secretion. Not only do the irritants stimulate secretion and hurry on the

contents, but they interfere with absorption and with gas exchange by damaging the epithelial cells. The second factor is the distension of the bowel which, in surgical diseases of the abdomen, is usually caused by injury or disease of a segment lower down. The distension compresses the venules in the bowel wall so that the arterioles become a pressure pump, as stressed by Wangensteen. Blood is forced into capillaries faster than it can be removed, and the bowel wall becomes congested. Fluid is forced out of the capillaries, causing œdema of the bowel wall, and it transudes into the lumen, causing more distension, and into the peritoneal cavity. Either one of these factors, the irritant or the distension, or both together, can cripple absorption and endanger the life of the patient (fig. 1B).

The data contributed by pathology is the nature and extent of the gross organic changes in the bowel. Part of the intestinal tract, marked in the diagram by shading, is inflamed and more or less crippled. The bowel wall loses its sheen and is perhaps covered by fibrin. It becomes swollen, œdematous and congested and, after operation, studded with petechiæ and small hæmatomas. It is flabby in texture, and may be stuck and kinked by exudate. Dysfunction results. Absorption and propulsion are impaired. The nature and distribution of these changes are very much the same, although varying in degree, whether their cause be trauma (even exposure to air causes a peritonitis) or infection, operation or disease, appendicitis, salpingitis, complicated hernia, or rupture of a peptic ulcer. The involved zone, usually the ileocæcal loop, is the middle zone. Above this is the upper zone, the duodenum and the greater part of the small intestine, which lie unaffected in their sheltered position under the parietal peritoneum, mesocolon, transverse colon and omentum. In peritonitis, the upper zone bears a heavy responsibility. It is left single-handed to deal with the bile and pancreatic juice and other fluids, and to maintain the fluid and gas balance. Fortunately, with its rich blood supply, villi and valvulæ conniventes, it is the part of the alimentary tract best fitted for the burden. The lower zone, below the damaged loop, is of little importance in the pathology and treatment of peritonitis.

POSTOPERATIVE MANAGEMENT

The term "peritonitis" is used in its widest sense, and extended to include even the mild inflammation which follows an interval appendicectomy. It is used in a pathological rather than a clinical sense. Such extended use of the term encourages a desirable consistency in after-treatment in all cases, mild or severe. From these simple facts, the correct methods of postoperative management follow inevitably.

Elective alimentary rest.—During the period of inflammatory crippling, often lasting for a week or more, the middle zone must be left at rest, for rest is the greatest healing agent for inflamed and injured tissues. At the same time, in the upper zone, the excretion-absorption balance must be

preserved. The patient's anorexia and the consequent diminution in the flow of digestive juices, the natural immobility of the inflamed and injured intestine and of the intestine above this, conduce to these ends. It remains for us to abstain from any impatient or irrational steps which may frustrate nature's efforts.

Only those fluids may be taken by mouth (and milk is not among them) which need no digestion and can be readily absorbed—water with glucose and lemon juice, or with yeast extract ("vegemite"), and sometimes with amino-acid preparations ("hepavite"). They must be sipped in small quantities at frequent intervals, to avoid exciting gastro-ileal and gastro-colic reflexes. Later, perhaps after four to six days, when nature has established with more security her local defences in the middle zone, bread and butter, chocolate, butter-scotch and other non-residue foods may be taken, in small quantities at a time, and eaten slowly. In practice, the use of this system is facilitated by giving precise typewritten instructions covering the whole of the postoperative period. These may appear unnecessarily rigid, but they are preferable to leaving important details to the untutored whims of the nurse. It is impracticable, and unnecessary except in the very severe cases, for the surgeon to give detailed instructions for each patient. But he can easily direct variations should the necessity arise.

Thus, before the end of the first week, the patient takes a diet, with all the elements necessary for life, using only the upper zone, resting the diseased middle zone and having no bowel actions. Patients and nurses who have not been educated to the method need reassurance that the absence of bowel movement is "according to plan", even after two or three weeks. Under this regime, described as "elective alimentary rest", patients recover smoothly and without distension from severe degrees of peritonitis, even that found many hours after the rupture of a gangrenous appendix. Mild distension disappears spontaneously.

In the first week the food intake does not measure up to normal requirements and weight is lost. But, as a rule, this is of little consequence, because most patients undergoing operation are well nourished, and the interruption of their normal feeding is but of short duration. They can easily draw on their reserves. The work of Carlson (1914) is of fundamental importance in this respect.

The patient in a state of malnutrition, usually due to a carcinoma of the alimentary tract, presents a different and a special problem, the solution of which is a task for the preoperative and not for the immediate postoperative period.

Banishing the bedpan; the economical use of the nurse.—The method of "elective alimentary rest", combined with a scheme of early ambulation, achieves a salutary revolution in the surgical wards. The bedpan practically vanishes. As a rule, patients have their first postoperative bowel action, a natural movement, during the second postoperative week, and by this time

they are easily able to go to the toilet. Many of the patients after appendicectomy have their first action after their return home on the fifth postoperative day. Relief is thus afforded to the nursing staff from the unpleasant task of securing and disposing of unnecessary and artificially provoked evacuations. The saving in embarrassment for the patient and in discomfort for his neighbours can best be appreciated by one who has been a patient in a ward devoted to aperients, enemas, liquid motions, and bedpans.

Fæcal impaction occurs but rarely, and chiefly in old people admitted to hospital in an acute abdominal emergency with bowels already overloaded. But it is a small price to pay for added safety in peritonitis.

THE ABUSE OF PURGATIVES

The principles of treatment outlined are simple and effective, but unfortunately there are still practitioners who have vague ideas expressed in vague terms, such as "paralytic ileus", and who are obsessed with the old expulsive superstition. They insist upon purging their patients. The purgative upsets the fluid and gaseous exchange at the surface of the mucosa in the upper zone, so that this part becomes a predominantly excreting, instead of an absorbing, organ, and vainly tries to empty itself of its excessive contents by battering against the immobile and stricken middle zone. Distension results, and this causes vascular congestion in the wall of the gut, which further hinders absorption and encourages transudation, thus establishing a vicious circle. The potential obstruction is converted by the medical attendant into an actual obstruction, because the diseased middle zone can deal with a trickle from above, but not with a torrent. Moreover, in the middle zone, damage is done by breaking down the early efforts at repair.

The giving of enemas is an irrational procedure because a little gas or fæces in the lower zone is of no importance in the disease, and the enema itself is dangerous and damaging to the middle zone, just as are aperients. Perhaps if the enema is a very small one, and of normal saline, it may not do much harm, because it may not flow round to the cæcum. But the rectosigmoid loop, inflamed by the peritonitis, may suffer harmful disturbance in the insertion of the tube and the injection of fluid. In any event, the issue is decided in the upper and middle zones, not in the lower.

Parasympathetic stimulants and pituitrin should be avoided; so also should aperients during the forty-eight hours before operation.

One of the pernicious beliefs entertained by many is that abdominal distension is an indication for violent expulsive therapy. Such beliefs menace the life of the patient. Mild distension nearly always steadily disappears under "elective alimentary rest". If the distension is marked, or if it fails steadily to disappear, or if the vomiting of brownish fluid or its aspiration through a stomach tube shows that absorption and secretion have become unbalanced (fig. 1b), then continuous aspiration and intravenous infusions must be used. Purgatives, enemas and the like, never!

TEXTBOOKS AND A NEW EXPLOSIVE

Unfortunately, dangerous practices in the postoperative period receive encouragement from the ridiculous and contradictory teachings included in many modern textbooks, some of which I have quoted in a previous article (Kinsella, 1946). Some of my surgical colleagues have tried to reassure me that the actual practice of surgeons is more enlightened than that described in the textbooks. I know this to be true for surgeons who have given thought to the physiological bases of abdominal surgery. The methods employed by those with special knowledge and skill are always in advance of those described in the textbook. The great bulk of surgical practice, however, is not in such hands, but in the hands of those who, from their student days, remain very much under the influence of their textbook, and this not always the latest edition. It behoves the writers of textbooks to set their house in order. Since my last publication on this subject, there has appeared in Great Britain the fourth (1947) edition of an otherwise very fine textbook which in this matter provides a further example of that confusion and contradiction which are so often presented to the student.

> In acute peritonitis the surgeon is advised to keep the bowels at rest for a week or more, but to give turpentine enemas for distension. But, of course, distension occurs in most cases. So the surgeon must keep the bowels at rest and give turpentine enemas at the same time! In the non-operative treatment of acute appendicitis "the first aim is to keep the inflamed parts absolutely at rest" . . . "but the bowel may be opened by enemas". "Emergency cases, operated upon without preparation, are no more liable to complications than others". As a routine, therefore, ". . . an aperient, and soap water enema are given before operation" (page 2), "and repeated after operation" (page 4). And so we need not be surprised that "gas distension of the abdomen is so common a postoperative complication as almost to be regarded as the rule" (page 9).

Even in "British Surgical Practice" (vol. 1: "After-care"), the traditional British ritual of purgation before and after operation is adhered to, although its rôle in causing painful colicky spasms is admitted.

In a well-known "Surgical Handicraft" it is written that "paralytic ileus" may be treated by the method of stimulation or by the method of rest. The latter method includes a turpentine or ox-bile enema, and then another turpentine enema. If these fail, a spinal anæsthetic and the passage of a rectal tube high into the colon through a sigmoidoscope are resorted to (as though the sigmoidoscope could get through the obstructed ileocæcal region!). If this be rest, Heaven preserve us from activity! Neither is far removed from the barbaric practices of the Zulu mother, who thrice daily inflicts upon her infant an enema administered through a hollow reed, convinced that if this were not done, the child's bowels would not open.

If anyone doubts that the evil spirits of primitive times still stalk the earth, and that their cult and ritual are still to be found in the shrines of modern medicine, I need only point to the unholy anticipation with which the *British Medical Journal* (1948) looked forward to the introduction into

Britain of a new compound, D.F.P., discovered fittingly enough during research in chemical warfare, and which can be used to batter a way, with almost explosive effect, through the sick and ailing bowel. It can even sensitize the normal subject for weeks and produce a tumult of intestinal contractions.

TEACHERS OF SURGERY

In order to secure a picture of present-day beliefs, I wrote to leading surgeons and teachers of surgery, in Great Britain, Europe, America and New Zealand. I asked them to describe their methods in regard to feeding, aperients and enemas after abdominal operations. I received fifty-three replies. Some of these were incomplete, probably because their authors had no method in the matter.

Sixteen used a good scheme of feeding, observing well the principles of "elective alimentary rest"; eleven, a fair scheme; and three advocated indulgence in a full diet from the first postoperative day.

Thirty opposed aperients; eight advocated their use on different postoperative days.

Twenty-eight advocated, twelve opposed, enemas.

Sixteen advocated enemas and opposed aperients.

None advocated aperients and opposed enemas.

Six advocated a combination of enemas and aperients.

Ten opposed both enemas and aperients.

Some authors were vague; for example, they seldom advocated aperients unless indicated, or they deprecated the routine and excessive use of aperients, but gave no account of the circumstances in which they were to be used. Others were self-contradictory; for example, "we subscribe to the idea of alimentary rest as a general principle but prefer to individualize each case", in that, if the appendix were ruptured, D.F.P. was used, perhaps with pitressin or prostigmin, a low pressure enema of the irritant variety was given, and a Miller-Abbott and a rectal tube were left in place.

Many seemed a little shamefaced in confessing their use of the enema, and used euphemistic expressions, such as "small flatus enemas", "mild washings", "low enemas", "gentle low saline or soapy enemas in some cases", "occasional saline irrigations". It is difficult to see how really mild procedures which do not disturb the colon, could do any more than secure a few flecks of fæces from the rectum. Even if such futile procedures do no harm, it is difficult to see how they can do good. The author of a textbook explained in his letter (but not in his textbook) that the enemas which he advocated were "low pressure enemas". It is, of course, by the "low pressure enema" that the radiologist drives the barium to the cæcum and through into the ileum. The high pressure enema is quickly resented, and expelled by the colon. One surgeon replied that his clinic had used enemas until five years ago, when they lost a patient because the enema "blew-out" through the appendical stump. Many, like Wangensteen, have noted the extension

of inflammation after an enema. One surgeon described himself as a "great believer" in postoperative alimentary rest, and referred me to an article which he had written in *The Practitioner*. In this he shows an understanding of the intestinal tranquillity which normally follows a laparotomy (although he most ineptly names it "active ileus"); he respects it scrupulously, until almost the last moment; but then, when the less affected lower zone announces its recovery by the passage of a little flatus, discretion is thrown to the winds and the whole intestinal tract is thoroughly flogged, regardless of the stage of recovery of the middle zone. Very many surgeons fall into similar error, failing to realize that the bowel is not uniformly diseased, that it does not recover as a unit, and that its varying parts need varying lengths of time for recovery. Thus, if the upper zone can produce a borborygmus, or the lower zone a little puff of wind, it does not necessarily follow that the middle zone is in a fit state to withstand a battering by aperients and enemas, and to deliver a flow of intestinal contents with an energy far in excess of the normal.

Other surgeons divided their patients into two groups, one with, and the other without peritonitis. But this distinction is invalid. All the patients have peritonitis, even if it is not clinically obvious, ranging in an even gradation from the mildest to the most severe. This is more than a matter of terminology, because the two groups are submitted to contradictory plans of treatment. Some of these surgeons treat the severe cases by alimentary rest, and submit the milder ones to a rigor of activity, exceeding even that customary in normal health. Others commit the contradiction in the reverse fashion. The extreme contradictions in therapy contrast sharply with the even gradation in pathology.

Among the replies there was testimony to some unique methods and beliefs. One surgeon advocated the Miller-Abbott tube after practically every laparotomy. Another made free use of blood transfusion, but only direct transfusion, having "no use for the canned garbage dispensed by the blood bank". Another set great store by coca-cola.

MORTALITY AND AFTER-TREATMENT

Among my fifty-three correspondents a few reported their mortality in acute appendicitis.

The best results were those of A. B. McGraw and his colleagues from the Henry Ford Hospital, presented in 1948 at the Annual Convention of the American Medical Association. There were no deaths during a five-year period (559 cases).

The next best were those of J. Shelton Horsley—0.84 per cent. in 594 cases (1938).

The third best were reported by Tor Hiertonn from the General Hospital, Orebro, Sweden—1 per cent. in 2000 cases.

In each of these three clinics the principles of alimentary rest are not only "subscribed to", but carefully applied.

My own personal series has grown from the 346 cases reported in 1946 to nearly 400, with no deaths.

In all clinics reporting a higher mortality than 1 per cent. there were gross breaches of "elective alimentary rest". In some, the clinicians were dominated by the biochemical laboratory and by the ill-founded fears of a negative nitrogen balance, even in the average well-nourished patient. The surgeons in one great clinic explained that they were led to stir up the alimentary tract "earlier than nature desires it" so that they could get on with the oral, as well as with the parenteral, feeding! But if they were to give up their routine aperients and enemas, their D.F.P. and prostigmin four-hourly, they would then be able, in the first week, even in a severe case, to utilize the upper zone for feeding. Such a reduction in the violence of their after-treatment would reduce their mortality.

"PARALYTIC ILEUS": A MEANINGLESS TERM

The term "ileus" is derived from a Greek word meaning "to roll". It is not clear whether the intestine or the patient rolls. It is stated in "British Surgical Practice" (1947, vol. 1, "Acute Appendicitis") that there are two groups of patients with "ileus", one suffering from peritonitis, the other from intestinal obstruction. In the first group, neither the intestine nor the patient rolls. The difficulty is worse when "ileus" is described as "paralytic", because, if paralytic, there can be no rolling. Even when there is absence of "rolling", peristalsis can usually be stimulated by drugs or by spinal anæsthesia, showing that there is no true paralysis.

As the derivation of the word is confusing, so also is its definition confused. Sometimes it is used to indicate the failure of the bowels to act within a certain time after operation (and different authors fix different times); sometimes to indicate intestinal distension; sometimes colicky pains; sometimes vomiting; and sometimes a combination of two or more of these symptoms.

With such confused derivation and definition, the term cannot be of value. As already mentioned, it is used in "British Surgical Practice" to include two different diseases, the symptoms and treatment of which not only differ but even contrast. Confusion becomes worse in the works of authors who find, not two, but fifteen or twenty diseases to group together as "ileus". One modern author speaks of "true ileus", "false ileus", "false inflammatory ileus", and so on. Another distinguishes "active ileus" from "paralytic ileus", using the term "active ileus" most ineptly for that period of intestinal tranquillity which normally follows a laparotomy. Disturbance of intestinal behaviour has so many causes, which differ so widely in mechanism and treatment, that only confusion results from the attempt to deal with them under one section. It is much better that intestinal distension should be dealt with under the various diseases which cause it—peritonitis, intestinal obstruction, typhoid fever, cardiac failure, hysteria.

A precise terminology is not merely a matter of literary purism. Plato

records the teaching of Socrates that " to use words in the improper sense is not only a bad thing in itself, but it also generates a bad habit in the soul". False terms create and perpetuate false ideas. The term "ileus" has for generations encouraged and covered up woolly thinking and vagueness and contradictions in treatment. When used by the voice of authority, false terms are particularly mischievous. The false words and false ideas lead to wrong action. Thus, not only do the minds of the speaker and listener suffer, but also the body of the patient. In peritonitis, and after abdominal operations, surgeons are too often found like "the generality of men" in the time of Socrates, "fumbling as it were in the dark, and making use of strange names, so as to demonstrate them as the very cause". If the bowels fail to act by the prescribed day, or if colicky intestinal contractions begin, or vomiting, or if the patient is distended, the condition is labelled "ileus". The label is mistaken for a diagnosis, and the surgeon feels no further urge to understand, and so proceeds to treat without understanding. It naturally follows that "paralytic ileus" is treated with "anti-paralysants", just as dyspepsia would be treated by pepsin mixture. It is hard to understand why such irrational viewpoints can still persist, in face of the clear conceptions which are set out in figure 1, and which should by now be a part of the heritage of medicine. Perhaps the facts have been handicapped in their struggle for acceptance because they have no convenient word symbol. The basic fact is the crippling of the middle zone. It is not adequately described as a "peritonitis" because the damage involves all layers of the bowel wall. The term "entero-colitis" is already in use to describe a condition which originates in the mucosa and is manifested by diarrhœa. "Ileitis" has already been claimed by Crohn. I suggest that we use the term "postoperative ileo-typhlitis". The advantages of such a step would be far-reaching. If the condition were so recognized and so named, practitioners would not be led so easily to treat it by aperients, ancient and modern, by enemas and by injudicious feeding—and even by cæcostomy! The two grades of the condition are (1) "ileo-typhlitis with balanced exchange", shown in figure 1A, and (2) "ileo-typhlitis with unbalanced exchange", shown in figure 1B.

How easily the appropriate action follows when the terms are precise! Grade 1 is treated by "elective alimentary rest"; supplemented in Grade 2 by intestinal aspiration and intravenous fluids. There is no room here for the old expulsive superstitions.

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CONVALESCENCE

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CONVALESCENCE may be defined as the period of restoration of health after disease or injury. More precisely it is the time when wasted tissue is restored and the body weight lost during the disease process is regained. The metabolic picture is dominated by building-up or anabolic processes, whereas during the acute phase of disease, or immediately after injury, wasting or catabolic processes are accelerated. Convalescence begins when these catabolic processes return to their normal rate, and ends when a state of balance between catabolism and anabolism is reached and after all tissue wasting has been made good. The convalescent phase has to be considered in relation to the preceding catabolic phase. If wasting proceeds at a rapid rate or is prolonged over weeks or months, the anabolic or convalescent phase must in its turn be prolonged. Treatment of convalescence may thus be directed first towards a reduction in the rate of wasting or in the duration of these wasting processes, and secondly to an acceleration of the reparative or anabolic processes.

During the war it was shown that the intensity of the catabolic processes was in some measure influenced by the severity and nature of the trauma. Later it became clear that the nutritional status of the patient had a great influence on the metabolic disturbance. If the patient was debilitated at the time of the injury the catabolic response to trauma might not appear. If it did appear in severely debilitated patients the outcome was usually fatal (Browne *et al.*, 1945). Infections produced metabolic changes which were exactly of the same nature as those seen after trauma. In the surgical patient the preoperative dietetic treatment has a great influence in determining the nature of the reaction to surgical trauma, and an even greater influence on the immediate repair of surgical wounds.

THE IMPORTANCE OF NITROGEN BALANCE

The essential principles involved in the shortening of the duration of the convalescent period are best illustrated by considering the various factors which play a part in determining the course of the catabolic and anabolic phases after surgical operations. As one of the most prominent metabolic disturbances in both these phases is altered protein metabolism, it is possible to assess the nature and magnitude of these disturbances by following the nitrogen balance. When nitrogenous equilibrium is attained the amount of nitrogen present in the protein contained in the diet is equal to the amount of nitrogen excreted in the urine and the fæces. A state of positive balance indicates that nitrogen is retained in the body, presumably as protein. The amount so retained is the difference between the nitrogen intake and

that excreted. When the nitrogen excreted exceeds that in the diet, the individual is in negative nitrogen balance. The excess of nitrogen excreted over that ingested represents nitrogen derived from body protein which has been broken down. Each gramme of excess nitrogen excreted in the urine is equivalent to approximately 6.25 g. of body protein destroyed. The nitrogen balance is susceptible to what might appear to be relatively trivial changes. For example:—

Keys (1944) found that in normal individuals it was possible to obtain nitrogenous equilibrium on a protein intake of 54 g. a day (8.6 g. nitrogen). When these subjects were put to bed for three weeks and maintained on the same diet they all went into negative nitrogen balance and lost weight. At the end of three weeks the nitrogen losses varied between 38.5 and 51.7 g. These losses were equivalent to body protein losses of 241 to 323 g. The magnitude of these losses may be appreciated when it is realized that the total amount of plasma protein in circulation under normal conditions is about 200 g. However, when the protein intake was raised to 110 g. (17.6 g. nitrogen) a day in another group of normal subjects also confined to bed, they went into positive nitrogen balance. Putting a patient to bed unless his protein intake is adequate may thus bring about tissue wasting. Most normal subjects in bed require about one gramme of protein per kilogramme body weight per day to achieve nitrogenous equilibrium.

After simple herniorrhaphies and uncomplicated appendicectomies it has been found that a negative nitrogen balance, such as usually follows any surgical operation, may be avoided if the patient is permitted to carry out active exercises and to be ambulant within a few days of the operation. If active exercise is not considered desirable, the negative nitrogen balance may be reduced to an almost negligible value by passive movements and massage. If active and passive movements are not encouraged, the daily negative nitrogen balance in such patients may average between 2 and 2.5 g. per day, and the period of negative balance may last about fourteen days.

In all these experiments the daily protein intake was approximately 1 g. per kg. body weight. When active and passive movements of the limbs were permitted the patient suffered but little from muscular weakness when he became ambulant, and his body weight showed little, if any, change from its preoperative level. The patients retained in bed for fourteen days after operation, however, showed marked muscular weakness and a loss of weight much greater than could be accounted for by their protein loss alone. The muscular weakness disappeared rapidly once they achieved positive nitrogen balance, and their weight loss was repaired in a few weeks.

In another group of subjects on whom similar operations had been performed, active and passive exercises were not given and the patients were kept in bed until the fourteenth day. Instead of maintaining the protein intake at 1 g. per kg. body weight per day, the intake was raised to 1.5 g. per kg. The average negative nitrogen balance per day was only slightly reduced (1.8 to 2.2 g./day) but the duration of the negative balance was reduced from an average of fourteen to ten days (Cole, 1948).

Thus these experiments show that in relatively minor surgical operations it is possible, by active exercise, passive movements and massage, and increasing the dietetic protein, to eliminate or reduce the catabolic response to be expected after surgical trauma. After more severe operations and serious accidental injuries, the catabolic response is greater (Beattie, 1947) and it may not be possible to employ all these measures. The catabolic response in such patients may be very intense in the first ten days after

trauma, and during this period an increase in the daily protein intake to a level of 1.5 g. per kg. body weight may not reduce the negative nitrogen balance obtained on an intake of 1 g. per kg. body weight. On the other hand, once the peak of the catabolic response has been passed, a high protein intake rapidly brings about equilibrium and then positive balance. The over-all period of negative nitrogen balance is thus reduced, and the convalescent period begins with a smaller nitrogen loss to be repaired and a smaller weight loss to be regained.

So far only individuals in good nutritional status have been considered. The debilitated patient after operation or suffering from an infection may not exhibit a catabolic response. For example:—

A patient suffering from an annular carcinoma of the œsophagus had lost about 20 kg. over a period of three months on account of difficulty in swallowing food. Before operation he was in nitrogenous equilibrium and his weight was stable on a diet which contained only 30 g. of protein a day. On the day of the operation and the following six days his protein intake was raised to 54 g. a day. In addition he received 500 ml. blood and 1 litre of normal plasma on the day of the operation. On this intake he was in nitrogenous equilibrium. To ensure complete absorption of this increased protein intake the protein was provided as protein hydrolysate given by the intravenous route (Beattie, 1947, 1949). The nitrogen balance became positive at the end of the second week after operation and continued positive during the following week. Although the operation for removal of the œsophageal growth and re-establishment of œsophageal continuity must be regarded as severe, there was no evidence of a catabolic response.

Less frequently, a debilitated patient may respond to operation by what appears to be a normal catabolic reaction, and then three or four days after operation dies without apparent cause.

A patient weighing 48 kg., with an operable gastric carcinoma, was maintained in nitrogenous equilibrium on a diet which provided 0.75 g. protein per kg. per day. He had lost 20 kg. over a period of six months and was markedly emaciated. Operation was undertaken successfully. On the day of operation and the succeeding days the protein intake was given as intravenous protein hydrolysate. The protein equivalent of the hydrolysate was 54 g. a day (1.12 g. per kg.). In addition to this hydrolysate he received 500 ml. blood and 1 litre of normal plasma on the day of operation. On the day after operation the apparent negative nitrogen balance was −8.5 g., and on the third day −12.2 g. He died on the fourth day. At necropsy the site of operation showed no sign of a leak of contents from the alimentary canal, nor was there any evidence of inflammation within the peritoneal cavity. The lungs were normal. It was clear that this patient showed an exaggerated catabolic response which in his debilitated state was incompatible with life.

As there is no method of predicting whether a catabolic reaction or absence of reaction will follow trauma in a debilitated subject, it would appear desirable in such cases to restore at least some of the protein deficiency before operation is attempted. The following case illustrates how such preoperative treatment can influence the postoperative reaction.

A poorly nourished boy of fourteen received fractures of both tibiæ and fibulæ and extensive lacerations of his right leg. After ten weeks in hospital the fractures were still ununited and epithelialization of the limb surface had ceased. At this stage skin grafting of the leg wound area was attempted. During the week after operation he remained in nitrogenous equilibrium on an average daily protein intake of 35 g. The skin graft was unsuccessful. The protein intake was now raised

to 95 g. a day. At the end of a week there was active epithelialization at the edges of the skin wound and the denuded area from which the skin graft had been taken was healing rapidly. During this period of increased protein intake there was a positive nitrogen balance of 8.2 g. a day. The protein intake was increased to a level of 137.5 g. a day and maintained at this level for two weeks. During the first week on this diet the positive nitrogen balance averaged 13.6 g. a day and fell slightly to 11.6 g. a day during the second week. The over-all gain in body protein over these three weeks of positive nitrogen balance was 1.46 kg. Operation was now undertaken to apply a skin graft to the leg wound. During the week following operation the diet contained an average of 118 g. protein a day and the nitrogen balance was negative to the extent of 37 g., representing the destruction of 231 g. of body protein. The normal catabolic response had thus occurred, but it had led in this week to a loss of about only 16 per cent. of the protein gained during the preoperative period. The skin graft "took" successfully and the fractures were firmly united after four weeks of increased protein intake.

THE CONVALESCENT PERIOD

The measures used to influence the nature and to lessen the severity of the catabolic response precede the actual treatment of the convalescent phase. The treatment to be followed in this latter phase is essentially simple and consists of measures designed to accelerate anabolic processes. The obvious measure to adopt would be to increase the amount of *protein in the diet.* If the total calorie content of the diet does not exceed the total calorie needs of the body the increased protein content will largely be wasted, for it will be used as a source of energy. On the other hand, if the diet is to be increased in calorie content, what should be the total calorie intake and what proportion of this intake should be protein? Experimental work on human subjects who had lost considerable weight as the result of food deprivation (Beattie, Bell and Herbert, 1948) has shown that the amount of protein retained on a diet which provides an excess of calories over the calorie requirements of the body is higher as the ratio of non-protein calories to protein calories is increased. The optimum ratio would seem to be about 6:1. If a practical limit of 3500 calories as the total energy value of the diet be taken, then about 500 of these calories should come from protein and the remainder from carbohydrate and fat. On this basis about 122 grammes of protein would be required in the diet.

As it has been shown experimentally that a normal subject in bed requires about 1 g. of protein per kg. body weight to achieve nitrogenous equilibrium, a 60 kg. man would have $122 - 60 = 62$ g. of protein which might be available for storage. The positive nitrogen balance to be expected on such a diet would be $\frac{62}{4.1} = 15$ g. a day. Unfortunately this relationship does not obtain always in practice. When the calorie value of the diet is increased in persons who are emaciated the immediate reaction of the body is not to store the excess energy as fat or protein, but rather to increase its rate of metabolism (Beattie and Herbert, 1948). Some of the added protein is used for energy production and the positive nitrogen balance is only a fraction of that expected. After some days this accelerated metabolism shows signs

of reduction and with this reduction the amount of protein conserved increases. It rarely, however, reaches the expected value. Some individuals persist in breaking down protein at a rate greater than normal, even in the convalescent period. They use some of the added protein as a source of energy, but instead of expending this energy at once, they store it as fat. The nitrogen balance becomes positive but the magnitude of this balance may be only 5 g. a day or less, instead of the expected 12 g.

It may be argued that the positive balance may be increased further by raising the protein intake to a higher level. Unless at the same time the total calories are raised, such treatment may not increase the positive balance materially. There are limits in this process of raising calorie and protein intake. A diet of 3500 calories a day is practicable, but one of 4500 makes demands on the patient's ingestive capacity and on the ingenuity of the dietician, which often cannot be met. Diets of 4500 to 5000 calories a day have been devised and have been ingested successfully. The difficulties involved in the preparation and ingestion of such diets, however, preclude their use except under the most favourable conditions. So far as diet alone is concerned, the treatment of the convalescent patient requires (1) that a high calorie diet be provided (3500 calories and upwards), and (2) that the protein content of the diet should be such as to provide about one-sixth of the total calorie value.

Testosterone propionate has been used to increase the retention of protein and so to increase the magnitude of the positive nitrogen balance in convalescence.

Kenyon and Knowlton (1942) gave 25 mg. of testosterone daily in divided doses and found that the positive nitrogen balance rose from 0.060 to 0.096 g. per kg. per day. In a 60 kg. subject this would represent a rise in the positive nitrogen balance of 2.2 g. a day or 13.7 g. of protein. However, when the protein intake was raised to give a positive nitrogen balance of 0.093 g. per kg. per day, testosterone propionate only raised the positive balance to 0.109 g. per kg. per day, or by just short of 1 g. (0.96 g.) in a 60 kg. man.

Testosterone would therefore appear to be of value when the patient can be given only a relatively low calorie and protein intake and it is desired to increase the positive balance to the highest possible level on a limited intake.

DIETETICS

Preoperative period.—The diet required to achieve nitrogenous equilibrium in a patient kept in bed must contain about 1 g. of protein per kg. body weight. If the diet is designed to contain 100 g. protein, a positive nitrogen balance can be achieved. To spare as much of this protein as possible the ratio of non-protein to protein calories should be about 6:1. The total calorie intake on such a basis would be 2870 calories, of which 410 would be derived from protein. The following diet (table 1), which admits of considerable variation, has been drawn up to approximate as closely as possible to these requirements.

Testosterone propionate may be used in divided doses up to a daily

TABLE 1

Foodstuffs	Quantity grammes	Protein grammes	Carbohydrate grammes	Fat grammes	Total cals.
Egg (1)	(1)	6.8	—	7.0	92
Beef—corned ..	50	11.2	—	7.5	115
Beef—stewed ..	75	23.0	—	6.5	155
Potatoes	250	3.8	49	—	200
Vegetables (carrots)	100	0.6	4.3	—	19
Bread	200	17.0	111.0	2.4	508
Butter	60	—	—	51.4	476
Cheese	20	5.0	—	7.0	85
Marmalade ..	30	—	21.0	—	78
Jam	30	0.1	21.0	—	78
Oatmeal porridge..	250	3.5	21.0	2.3	113
Sugar	50	—	105.0	—	196
Treacle tart ..	40	1.4	25.0	5.4	150
Milk, fresh whole..	900	30.0	43.0	33.0	594
Tea	*ad lib.*	—	—	—	—
Totals		102.4	400.3	122.5	2859

This diet provides breakfast, mid-morning snack, dinner, tea and supper.

When solid food is contraindicated, the following mixture (table 2) provides 102 g. of protein and 2835 calories. It may be given in small frequent drinks, but if necessary it can be given by an intra-gastric or intra-duodenal tube and allowed to drip at a maximum rate of 250 ml. per hour.

TABLE 2

	Quantity grammes	Protein grammes	Carbohydrate grammes	Fat grammes	Total cals.
Milk, fresh whole..	2500	82.5	120.0	92.5	1650
Milk, condensed whole unsweetened	100	7.6	12.3	8.4	155
Eggs, raw	100	11.9	—	12.3	163
Sugar	220	—	231.0	—	867
Water	—	—	—	—	—
Totals		102.0	363.3	113.2	2835

Water is added to obtain the necessary consistency for tube feeding.

As the above mixture has a rather high fat content it may prove unsuitable in some cases. The following basic mixture (table 3) may then be substituted.

TABLE 3

	Quantity grammes	Protein grammes	Carbohydrate grammes	Fat grammes	Total cals.
Milk, fresh skimmed	2500	85	127.5	5	875
Milk, dried whole..	60	15.8	23.3	17.8	318
Sugar	400	—	420	—	1576
Water	—	—	—	—	—
Totals		100.8	570.8	22.8	2769

Water is added to make this mixture up to a volume of about 3500 ml.

maximum of 25 mg. to increase the positive nitrogen balance during this period.

Postoperative (catabolic) phase.—In this phase it is desirable at the earliest possible moment to push the calorie and protein intake to the level advocated for the preoperative phase. This level may be reached in most cases by the fifth day (day of operation taken as first day). After the fifth day the protein and calorie intake should be increased, either by increasing in the appropriate amounts some of the items set out in the specimen diet, or alternatively by supplementing the preoperative diet by portions of one of the mixtures suggested for fluid feeding in the preoperative phase. The aim should be to reach a dietetic intake of 125 g. of protein and 3500 calories by the eleventh day. This level of intake is then maintained, or increased if it can be, for as long as possible. The milk intake may be presented as ice cream of known composition or as iced milk shakes.

In calculating the above diets a body weight of 65 kilogrammes has been taken as a standard. The diets may be adjusted to the needs of young persons on a body-weight basis. When the subject is an adult, but has lost considerable body weight, the requirements should be calculated on the basis of the normal body weight. It is often impracticable to get an emaciated individual to take such a high intake at once, but every effort should be made to attain it. Testosterone propionate at this stage is of no value; its use should be reserved for the preoperative and the convalescent phases.

Convalescent period.—The aim in this period is to increase the diet, but it will be found in most cases that a level of 3500 calories with the appropriate protein content is about the limit. None the less, every effort should be made to maintain this level or exceed it for as long as possible. The best check on the efficacy of the dietetic treatment is the nitrogen balance, but as this procedure requires much care and adequate skilled staff, it is not practicable in most circumstances. Daily weighings made at a stated time each day, or, if these are impossible, then twice weekly weighings, will provide some indication of progress. A steady weight gain of three pounds (1.5 kg.) a week indicates successful treatment. Gains in excess of this—up to a pound a day—have been achieved on diets of 4000 calories for short periods, but the patient often finds difficulty in ingesting such high intakes for periods of several weeks. Testosterone propionate has its greatest value in the first and second weeks of convalescence, but its use for more than seven to ten days is not desirable.

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THE RH FACTOR: SOME PRACTICAL ASPECTS

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How important is the Rhesus factor to the expectant mother and her child, and how should the practitioner interpret the reports on the samples which he has submitted to the laboratory for blood-group investigation?

Many people are discouraged by the fact that blood-group serology appears to have become a highly complicated subject. Although this is undoubtedly true, many of the details are mainly of academic importance, and by a recapitulation of some of the fundamental principles it is hoped to clarify and explain some of the phenomena involved.

EVOLUTION OF NOMENCLATURE

The main Rh factor, as originally described, was found to be present in the red cells of 84 per cent., and absent from 16 per cent., of the population. It is now known that instead of being a single entity the Rh factor is complex, and the antigen corresponding to the original supposedly simple Rh factor is now known as the D antigen. All people possessing the D antigen may for clinical purposes be called Rh positive, whilst those who lack D are called Rh negative. There are at least five other Rh antigens which may provoke specific antibody production. Fisher, studying this subject in England in 1944, designated by the letters C, D, E, c, d, e, the relationship of these antigens to each other. A chromosome will carry three of the six units—C or c (but not C and c) D or d, and E or e. Complications of nomenclature have arisen from the fact that at about the same time many people were working along parallel lines all over the world, each using his own terminology as new factors were discovered. The American equivalents of the main subdivisions of the English system are given for comparison:—

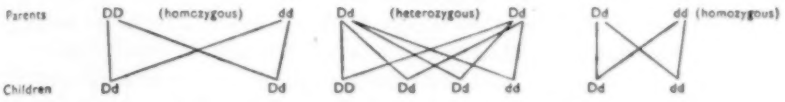
(1) CDe — R_1	(3) cDE — R_2	(5) cdE — R″	(7) CDE — Rz
(2) cde — r	(4) cDe — R_0	(6) Cde — R′	(8) CdE — Ry

(The order indicates relative frequency of occurrence in the European population.)

All the nucleated cells of the body, except the sex cells, carry two sets of 24 different kinds of chromosomes which determine the various characteristics of the individual, including his blood group. The sperm and ovum, each carrying only one set of 24 chromosomes, will decide the birthright of the new offspring from his parents. To illustrate the mode of inheritance, I shall take as an example the Rh antigen D.

The parent's tissue cells contain two sets of chromosomes and in each

set the Rh factor will be represented by the gene D or the gene d. When both Rh chromosomes contain D the individual is said to belong to the homozygous genotype DD and all his sex cells will carry the gene D. If one of the chromosomes contains D and the other contains d, he belongs to the heterozygous genotype Dd, and whilst half of his sex cells carry the gene D the other half will carry d genes. Alternatively, he may be of homozygous genotype dd, when all his sex cells will carry d genes. Graphically presented these statements may appear more intelligible:—



Both DD and Dd persons are Rh positive. The dd people are Rh negative.

STIMULATION OF ANTIBODIES

An antibody to one or other of the Rh antigens occurs only in response to its introduction into the body of a person who does not normally possess this antigen. But the six genes C, D, E, c, d, and e are not all equally capable of stimulating antibody production. The most villainous antibody-provoker is the gene D and this is why the recognized practice is to classify any person having the genotype DD or Dd as Rh positive (84 per cent. of the population), whereas those lacking D but having dd are termed Rh negative (16 per cent. of the population).

The Rh antigen may be introduced into the body in several ways:—

(1) By transfusion of Rh-positive blood (cells carrying D) into an Rh-negative (lacking D) person. Fifty per cent. of people so transfused will produce antibodies to D. Since d has only weak antigenic power the reverse practically never happens, and it is safe to give Rh-negative blood to Rh-positive patients.

(2) The recipient may be sensitized by intramuscular injections of quite small quantities of Rh-incompatible blood.

(3) An Rh-negative mother may produce antibodies during pregnancy if her fœtus is Rh-positive. Pregnancy, however, is not nearly so vicious an initiator of antibodies as transfusion, and it should be borne in mind that only 1:40 Rh-negative women with Rh-positive husbands will respond to an Rh-positive pregnancy by making antibodies.

MECHANISM OF RH ANTIBODY STIMULATION IN PREGNANCY

The way in which the Rh antigen crosses the placental barrier from the fœtal to the maternal circulation is still a matter for conjecture. It is suggested that when an Rh-negative woman conceives an Rh-positive child the blood cells of the fœtus may escape from the blood vessels of the placental villi and

on entering the maternal blood stream act as foreign bodies which stimulate antibody production. The antibodies thus formed pass back into the placental vessels, where they come into contact with the Rh-positive fœtal red cells, and by an antigen-antibody reaction the fœtal cells are gradually destroyed. There must, however, be some unknown factor governing the production of antibodies, because whereas some Rh-negative women are sensitized in their second Rh-positive pregnancy, others may show a response only after four or more pregnancies and many never develop antibodies in spite of repeated stimulation.

The presence of antibodies in the mother's blood stream in no way affects her health, but if it should become necessary for her to be given a blood transfusion special care must be taken to see that compatible Rh-negative blood is used. Rh-positive cells would be destroyed by her antibodies, perhaps causing a severe hæmolytic transfusion reaction with, quite possibly, a fatal outcome.

The destructive action on the fœtal red cells of the Rh antibody manufactured by the mother initiates the condition of "hæmolytic disease of the newborn", a disease which has manifestations of all grades of severity from mild anæmia to death of the fœtus *in utero*.

The ways in which an Rh-negative woman can become sensitized by transfusion or injection of blood, or pregnancy, have already been mentioned. Even a short pregnancy ending in an abortion at three months may engender antibodies, but supposing that the mother has not previously been sensitized the amount of antibody developed in one pregnancy is rarely enough to harm the fœtus. When, in a woman who has *not* previously given birth to a child suffering from any form of hæmolytic disease, Rh antibodies are then found, it indicates the advent of a child who *will* be affected, although not necessarily severely so. The disease tends to be milder on the first occasion of its appearance, but once the antibody is produced it may persist for years and will usually affect subsequent Rh-positive children with increasing severity until stillbirths result. Rh immunization is never a cause of abortion in the early months of pregnancy.

TYPES OF ANTIBODY

The easiest way in which to understand this problem is to follow in the footsteps of the research workers. Some Rh-negative volunteers were given small injections of Rh-positive blood and they responded by producing serum which would agglutinate known Rh-positive red cells suspended in saline. This type of antibody has been termed variously by different authors "ordinary", "complete", or "early" or "saline" agglutinin or antibody. When these immunizing injections were continued, instead of the agglutinin becoming stronger, as would be expected, it appeared to grow feebler. These results, however, were misleading because at this stage an important

change takes place, and the amount of antibody present can be shown actually to have increased if the known control Rh-positive cells are suspended in albumin instead of in saline. If the experiment is pushed still further a stage is reached when the volunteer's serum completely loses its power to agglutinate cells in saline but still agglutinates cells in albumin. This type of agglutinin may be reported as an "albumin", "incomplete", "blocking", "late", or "hyper-immune" antibody.

The strength of the maternal antibody, unfortunately, gives no true indication of the severity of the disease developing in the expected child and is therefore of little prognostic value, but, on the whole, if an albumin antibody is discovered in the maternal serum it may be assumed that the child will be diseased and plans for treatment should be made.

The Coombs test.—It may be important to determine as soon as possible after birth whether or not the child has hæmolytic disease, and this test will rapidly reveal the presence of antibodies attached to the surface of the red cells of the child. Although it is not a specific test for Rh antibodies, and may give positive results in such other conditions as acquired hæmolytic anæmia, it can safely be assumed that when applied to the blood of a new-born infant a positive result will indicate that the red cells have been sensitized by some form of Rh antibody, either complete or incomplete, although not necessarily the most common one, anti-D.

ROUTINE ANTENATAL INVESTIGATIONS

(1) Each pregnant woman should have her ABO and Rh group determined when she first attends the antenatal clinic. Dry-sterilized apparatus should be used for the withdrawal of 2 to 5 ml. of blood into a dry sterile bottle or test tube. Even small quantities of water or spirit may cause hæmolysis of the specimen and make the tests difficult to read. At the same time she should be asked about her previous history, with special regard to missed periods, abortions, miscarriages, abnormalities of previous children, or blood transfusions or intramuscular injections of blood.

(2) An Rh-negative primigravida without a history which would lead one to suspect previous sensitization need have no further investigations done in this pregnancy, since the first infant is practically never affected.

(3) (a) An Rh-negative multipara should have her serum searched for Rh antibodies, both complete (saline) and incomplete (albumin), as early as possible in pregnancy so as to detect Rh sensitization in its initial stages.

(b) A second search for antibodies should be made during the eighth month of pregnancy so that plans and preparations for treatment of the new-born child, if it should prove necessary, may be made.

(c) If facilities admit, additional tests may be done at intervals between the 12th and 32nd weeks which would demonstrate any fluctuation in the strength of the antibody. A steadily rising titre of antibody may

be a bad sign, but the actual height of the rise or its lack does not appear to be correlated with the severity of the disease in the infant.

INVESTIGATION OF FAMILIES

When an Rh-negative woman is married to an Rh-positive man they may be apprehensive about the prospects for their children. The likelihood of development of hæmolytic disease in a family depends upon several factors. Is the husband homozygous DD or heterozygous Dd? If he is homozygous, all his children will have a D gene and will be Rh-positive. If he is heterozygous there is an equal chance that the child will inherit D and be diseased or have only d and be unaffected. But more important than this is the tendency or otherwise of the mother to produce antibodies. Some Rh-negative women only respond after repeated Rh-positive pregnancies, and even if antibodies are present and an affected child is expected there are now methods of treatment which will save the lives of a number of children who might previously have died. So when discussing the family prognosis with the parents it is advisable not to paint too gloomy a picture unless one or more children have already been severely affected by hæmolytic disease.

To determine unambiguously whether a D-positive man is DD or Dd it would be necessary to use an anti-d serum, but since this is obtainable only from human donors and is likely always to be extremely hard to come by, it is necessary to use less direct methods. For instance, if a D-negative woman and a D-positive man have already had a D-negative child then it can be said with certainty that the man is heterozygous Dd. When for some reason it is not possible to discover the Rh groups of previous children it may be possible to deduce the man's genotype with a fairly high degree of probability, although not with certainty, from a knowledge of the relative frequency of occurrence in the population of the various Rh subgroups. Although a complete investigation would be interesting, owing to the great rarity of the sera, genotyping of fathers is only justified when the wife is known to have an Rh antibody. At present, although facilities exist throughout the country for the antenatal determination of blood groups, not all doctors are aware of the importance of having these tests performed at leisure instead of in a last minute rush when an emergency has arisen.

The National Blood Transfusion Service is ready and willing to give help or advice to anyone desiring further information. It is greatly to be hoped that practitioners in their turn will assist their Regional Transfusion Officer to continue and extend the service by informing him of all patients who have undergone Rh immunization and from whom grouping serum might be obtainable.

THE PSYCHIATRIC CHALLENGE IN GENERAL PRACTICE

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THE essential function of the physician has been defined as the healing of the sick; and this has always been accepted as including the sick in mind as well as in body. The fundamental implications of this definition are surely that the final aim of the physician is to make what contribution he can to the happiness and well-being of the individual.

On this premise, every physician has a specific obligation towards the neurotic patients who consult him; for these are often the most unhappy of all. Yet the emphasis in teaching medicine to students tends to label neurotic patients with what amounts to a moral stigma. Differential diagnosis embraces the pathological possibilities in a case: clinical judgment, wisdom, and experience, supplemented by the sensible minimum of essential investigations, selecting the most likely and excluding those without evidence of organic pathology—or with insufficient evidence to explain the severity of the symptoms complained of—and on this basis the division proceeds. The sheep are thus separated from the goats, the physically ill from the emotionally disturbed or maladjusted; and with this the physician's obligation to the neurotic is too often presumed to have been discharged. The sheep are gathered into the clinical fold, for further investigation and treatment; the goats are sent away with a firm reassurance that there is nothing to worry about—somewhat ironical advice to those whose basic disturbance is so often their apparently causeless anxiety and distress.

It is, of course, true in one sense that these patients have begun by confusing the issue themselves: they have complained of organic symptoms because in their own minds this is so often the way in which their mental disturbances announce themselves. The prejudice in favour of something physically wrong is not confined to our profession: it is widely shared by our patients. Yet whilst this is an observation that must occur repeatedly to most of us, how often do we seek an explanation for it? It is almost as though we embraced the prejudice while distrusting its examination; a powerful indication of emotional bias.

There is some excuse even for the trained physician in this matter. We are taught to make our clinical approach to diagnosis through the medium of differentiation from a limited number of known and acknowledged conditions, as though these constituted the sole possibilities in the case. This, although popularly accepted as a scientific procedure, is based on expediency; on empiricism rather than on absolute knowledge. None the less, there are worse bases than empiricism, provided its constant limitations are

borne in mind. We are reminded of these whenever some entirely new syndrome or disease process is recognized and described, to take its place for the first time in the hierarchy of possible conditions for differential diagnosis. But for the rest of the time we tend to forget the limitations while revering the procedure: to behave as though a complaint of headache, or hæmoptysis, or night sweats, for example, can only be due to one or more of an essentially limited number of known and recorded organic lesions, or, if none of these can be demonstrated or all can with reasonable certainty be excluded, to functional disorder or even malingering on the part of the patient.

It is noteworthy how these two latter possibilities come to be associated in the mind of the physician as the somewhat unsavoury residue of a process of elimination whereby all the more definite and respectable conditions have been patiently and inexorably excluded. The belief that this process of elimination is essentially scientific, in turn facilitates the rationalization that a somewhat critical or even censorious attitude to vague and inconsistent complaints of residual neurotic patients is no more than the reasonable response of a hard-headed practical clinician to the sediment clogging the delicate machinery of medical progress.

There are, of course, other reasons for such prejudice. An organic lesion is commonly easier to diagnose with precision, to demonstrate and to treat; moreover, its modification or disappearance is the proof of cure—or at least tangible evidence of improvement—an outward and visible sign of some degree of success. Against the neurotic patient, with his indefatigable capacity for continued complaint, seemingly unrelated to any objective pathology, many a harassed physician has felt driven to attack as the best method of defence. The patient's reaction to this is to cling yet more stubbornly to the idea of a physical basis for his symptoms, and to describe them in physical terms. Not only does this seem more respectable to him; he assumes it will also seem more respectable to his doctor. And, as has already been remarked, many patients' powers of introspection, description, and self-analysis are sufficiently limited to make physical complaint the only way in which they can either experience or express their need of help.

IMMATURITY AND NEUROSES

The essential immaturity underlying all neurotic reactions probably provides the fundamental explanation for their unpopularity with the great majority of more normal and therefore more fortunate individuals. The impatience and irritation which such patients often provoke in their acquaintances, family and friends, as well as in their doctors, spring from the normal person's subconscious recognition that they have failed to achieve the development which he has achieved, to make the adjustment which he has made, often with difficulty and against his will, and that they are now seeking an escape or displaying an inadequacy which his own more mature personality forbids him.

"There's really nothing the matter with you" says the exasperated

physician, aware that this is only a half truth and therefore no truth at all. And "You really must pull yourself together" echo the patient's friends, unable to contain their hostility to a weakness the implied demands of which seem so unreasonable since their own weaknesses have long ago been curbed in anguish and tempered by necessity in a more adult acceptance of reality. Moreover, they are scarred by this tempering process: they remember it as painful, a price demanded and paid for maturity; and they are angered by the apparently ruthless determination of the neurotic, weak as he appears in other ways, to avoid it at all costs. The challenge of maturation, which to them seemed inescapable, is one which they are determined he shall face; they will not, they cannot, excuse him from it: and when they tell him there is nothing the matter they are not seeking simply to encourage or reassure but also to attack him: to rub salt into wounds the very sensitivity of which offends them, in contrast to their own old but honourable scars.

Yet the patient, all too keenly aware that there is something very gravely the matter, but unable to acknowledge or understand what it is, repeatedly takes his sick and aching heart, his completely unresolved tangle of self-love and self-disgust, his fear and guilt and hate and shame, and lays them before the doctor disguised as complaints of nausea, "angina", diarrhœa, splitting headaches, sweatings, palpitations, dyspnœa on exertion, and so on. Nor are genuine complaints of this sort among neurotic patients confined to those with psychosomatic lesions; they are in fact more common among anxious and depressed patients with nothing whatever to show for their symptoms. So common are they that the percentage of these patients among those attending doctors' surgeries or general medical out-patient departments has been variously reckoned as between twenty and fifty per cent.

THE IMPORTANCE OF HISTORY TAKING

What is to be done about these patients? Should they be referred *en masse* to psychiatrists? It would perhaps be generally agreed that only a small proportion of them require such reference, even were the numbers of properly trained and experienced physicians specializing in this branch of medicine unlimited. As it is, their time is already inadequate for the needs of the more seriously disturbed patients whose maladjustment and emotional reaction are threatening their whole lives and personality. They cannot possibly take on every one of the general practitioner's patients in whom the emotional rather than the physical element predominates. Yet, as long as the practitioner can acknowledge in his heart any responsibility for the happiness of his patients, the practice already mentioned of sifting these patients out as a diagnostic exercise, much as a witch doctor smells out bad men, before consigning them to the outer darkness of their own inadequacy, is unquestionably not enough. This inadequacy, untreated, must inevitably drive them to consult someone else and, with ebbing courage and self-respect, to embark on the round of other hospitals and clinics. They become recidivists in hospital practice: a burden to themselves and the physicians.

Nor can the right orientation to this aspect of human suffering, which will inevitably constitute a large part of their subsequent clinical experience in general practice, be given to students by the precept and example which leads them to regard the diagnosis of neurosis in patients complaining of physical symptoms as tantamount to the unmasking of an impostor—a process of scientific detection which may bring credit and satisfaction to the examiner but which is chiefly valuable in relieving him of any further responsibility towards the patient so skilfully discredited. The alternative is to attempt to discover the basis of these patients' complaints in one or two further interviews devoted exclusively to this task, in the form of taking a fully adequate and comprehensive history. The objection immediately raised at this point is that the practitioner simply has not the time to do this. Supposing that he had, what might he achieve?

The technique of history taking, which embraces detailed attention to every aspect of the patient's life from his early childhood to his present marital or occupational difficulties, tracing these and the development in his personality which preceded them through school days and adolescence and all the readjustments, ambitions, day dreams and disappointments which accompanied them, as well as considering his family background and constitution on a wide basis, is at the disposal of every general practitioner as an invaluable addition to his clinical equipment, whether in practice he chooses to use it in full, often or seldom. Through such a history not only does a more complete picture of the patient *as well as* his complaint steadily emerge, but the rapport, gratitude and confidence felt by a patient for the doctor who displays so careful and penetrating an interest in his case, is itself of therapeutic value. T. A. Ross embodied this observation in a memorable phrase, ". . . so long as the patient is being treated, he is being examined; so long as he is being examined, he is being treated".

From the information thereby obtained, together with the results of physical examination, the practitioner will have achieved considerable insight into his patient's condition; he will be in a position to relieve the somatic complaints of much of their affective burden, because he will have come far towards perceiving their genesis—and may well in the process have led his patient along with him to this discovery too. He will no longer be tempted to commit the obvious but so easily perpetrated gaffe of telling a patient with pathological anxiety or depression that there is no cause for his distress; and if instead he rounds off his achievement with the help and advice appropriate to his patiently acquired comprehension of the problem, he will indeed have discharged his obligation to the patient in full. Any patient unrelieved by this procedure is most certainly the proper concern of the specialist in psychological medicine.

ILLUSTRATIVE CASE HISTORIES

The force of the indication for a full history in neurotic patients of varying grades of severity of illness is illustrated by brief consideration of three cases.

all of which passed through the hands of general physicians whose knowledge and skill were unquestioned.

(1) A manual labourer in his late forties, was referred to an out-patient department, with hysterical spasm of the right hand. This was removed within half an hour by forceful suggestion and persuasion: the same evening the man was brought back into the hospital in a police ambulance with his throat cut. He had committed suicide. Subsequent inquiry revealed that he had for some months been becoming increasingly depressed, retarded and anxious; that his efficiency at work, which demanded a modicum of manual skill, had decreased to a point at which he was in grave danger of losing his job, and that this had further oppressed and worried him, as he had a wife and family dependent upon him. The hysterical spasm had followed a trivial accident at work and represented the desperate temporary expedient of a simple man to stave off complete defeat and gain an honourable respite from the losing battle with an involutional depression which he was endeavouring to fight single-handed. The superficial cure had completed his undoing.

(2) A young ex-soldier of twenty-eight complained of eighteen months' history of anxiety insomnia, headaches, backache and general fears for his health; the symptoms were the continuation of the illness for which he had been invalided from the Army eighteen months previously, after nine months in and out of hospital. He had done no work since his discharge. He was married with one child, a daughter aged two. This man's anxiety and headaches had begun during his wife's pregnancy. While in hospital undergoing investigation—which included lumbar puncture—he received news that his unit was being drafted overseas and that he had been taken off the draft. His reaction to this was a mixture of relief, guilt, and fear, the last emotion crystallizing around the possible result and significance of the lumbar puncture which his fellow patients assured him meant that the doctors suspected syphilis. He had been unfaithful to his wife once, during her pregnancy, and this increased both his guilt and fear of venereal disease. The reaction of certain psychopaths who happened also to be in the ward at that time was to congratulate him upon what they insisted must have been his deliberate astuteness in dodging the draft on medical grounds, and to infer that there must be little he didn't know about malingering—unless of course he really had got syphilis. He had been as discomfited by their congratulations as he was alarmed and shamed by their speculations. Not simply his physical health but his personal integrity seemed compromised and in question: he had remained anguished and in doubt, and his anxiety, superficially focused on the possible implications and result of lumbar puncture, in fact extended deeply through his whole personality and undermined it. Once this became apparent, together with its contributory causes, he improved rapidly with comparatively superficial psychotherapy, resumed work, and regained sexual potency, the loss of which during his illness he had not even dared to mention to a doctor before. A year later he remained well and at work.

(3) A married woman, aged thirty-one, complained of troublesome visions before her eyes and profound fears for her sanity. The complaint was of almost a year's duration and had developed following an attack of influenza the previous March. She had been married two months before that, in January, to a man she had known for nine years and to whom she was devoted. Her own doctor wrote of her complaint of vision: "of course these were visual hallucinations . . .", and had attempted to certify her; subsequently another doctor had advised her against pregnancy and she had been persuaded to enter a mental hospital as a voluntary patient, whence she had discharged herself after three days.

Investigation revealed that she was not in fact hallucinated, but a life-long eidetic, that is, a person whose visual memory has a photographic quality, being abnormally detailed and accurate. Such people see vivid mental pictures of everything they remember: the condition is not uncommon in children, but persists only rarely into adult life. This particular patient showed also some obsessional tendencies, which had become attached to her eidetic imagery following the development of a post-influenzal depression. The effects of this had been that she had ruminated continually upon some of the more gloomy episodes of her past life, such as her attend-

ance at her father's death bed, and had conjured into her mind's eye visual recollections of these scenes as vivid, complete, and accurate in detail as eidetic images characteristically are. And just as her descriptions of these experiences had suggested hallucinations to superficial inquiry, so the sombre view of her prospects occasioned by this opinion accorded only too well with her own feelings of hopelessness and despair, reinforcing her worst fears that she was becoming incurably insane. All this cleared up completely with five electro-convulsive treatments, and she made a perfect and permanent recovery with full insight.

These three cases could easily be multiplied. All have one essential feature in common. In every one the vitally essential information was there, available to any examiner "with the time" to seek it out; in every one failure to do so had resulted in a greater or less degree of disaster for the patients; in the first, death; in the second, at least eighteen months' invalidism and loss of regular work; in the third, a year's marital unhappiness and, very nearly, certification. But even when the necessity for a detailed examination of these patients' histories is conceded, the problem of providing it remains acute.

HEALTH CENTRE CONSULTATIONS

The eventual establishment of Health Centres could be made to provide a possible solution of the problem, whereby both space and competent assistance became available to help to unravel the emotional problems to be found, not only among frankly neurotic patients, but also among those with predominantly organic disease.

This is a task which could in the main be performed by selected senior postgraduate students on a six months' basis, working in private rooms in health centres, these appointments being on a par with resident or casualty office appointments at hospitals, and available principally for those intending either to enter general practice themselves or to specialize in general medicine, neurology or psychological medicine, for which the appointments could form a recognized part of the training. Apart from their social and humanitarian value, such appointments would prove extremely educative to the young doctor, and would do much to prevent the adoption of an impatient or critical attitude, as an emotional defence against becoming involved in personal unhappiness, by men otherwise trained and prepared to regard such unhappiness as simply a by-product of the physical illness with which they are more directly concerned. Of all the disciplines of clinical medicine and research, the taking of an adequate history is perhaps the one most generally acclaimed in theory and neglected in practice.

To believe sincerely that there simply is not time to do this is inescapably to imply that the time should instead be devoted to some more worthwhile activity—such as seeing more patients. This would seem to beg the whole difficult question of the relative merits of maximum rate of turnover on the one hand, and the highest possible standard of individual service on the other: this is a problem which does not lend itself to facile simplification, complicated as it must be on a capitation basis by financial considerations. But where happiness as well as health is concerned, the type of consultation suggested may well be the final Court of Appeal for the individual patient.

CURRENT THERAPEUTICS

XXVIII.—HYALURONIDASE

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PIONEER work on hyaluronidase was done by Duran-Reynals (1929, 1942), Meyer (1947), McClean (1931, 1942), and Chain and Duthie (1940). Excellent reviews, with detailed information and full reference lists, have been written by Duran-Reynals (1942), and Meyer (1947). This article aims to give a short and, if possible, simple account of hyaluronidase; what it is, how it works, and to indicate its therapeutic possibilities.

In 1929, Duran-Reynals reported that extracts of various organs injected along with vaccinia virus increased the infective activity of the virus. Subsequent work by Duran-Reynals, Meyer and McClean indicated that the enhanced response to the virus was due to an increase in tissue permeability, presumably caused by the action of some constituent of the tissue extract which allowed the infection to spread. This factor was thereafter aptly described as the "spreading factor".

PHYSICO-CHEMICAL STRUCTURE

The permeability of a tissue depends upon the nature of its ground substance, whether that be of large amount, as in the connective or binding tissues of the body, or reduced to a minimum, as in the intercellular cement of epithelial tissues. In effect, tissue permeability is a function of the connective tissues and is regulated by the condition of the intercellular material. All connective tissues consist of cells, fibres, and a matrix which ranges from a semi-fluid consistency of varying viscosity to the ground substance of bone, hardened by the incorporation of mineral salts. Connective tissues offer considerable resistance to penetration by foreign fluids, and this resistance determines the permeability of the tissue. There are wide variations in the permeability of the different tissues and even of the same tissues, e.g. skin in the different regions of the same individual. There are also considerable differences in tissue permeability between individuals, conditioned to some extent by sex, age, hormone activity, particularly by the sex hormones, and vitamins such as vitamin C. The chemical basis of the ground substance of mesenchymal tissues, such as general connective tissue and stressed elements like cartilage and bone, is a mucoprotein. Mucoproteins are also a constituent of the intercellular cement in epithelial tissues and are found in many glands and mucous membranes. The mucoid or mucin part of the mucoprotein is a carbohydrate. This carbohydrate is a polysaccharide

and is referred to as the prosthetic group. The nature of the contained polysaccharides is one of the factors controlling the physical quality and consistency of any particular intercellular substance. Any substance which chemically affects the polysaccharides of tissue ground substance will alter the physical nature of the ground substance and change its permeability.

In vitreous humour, the umbilical cord, and synovial fluid, the polysaccharide is known as hyaluronic acid. The polysaccharide of corneal ground substance is mucoitin sulphuric acid, and of cartilaginous ground substance, chondroitin sulphuric acid. Heparin is another example of a polysaccharide. These polysaccharides are not chemically bound to protein but occur free or in salt linkage; they combine with free amino-acid groups at a low pH. Although its exact chemistry is unknown, hyaluronic acid includes such substances as hexosamine and glucuronic acid. It has a high molecular weight and does not dialyze through collodion membranes of great porosity. It is viscid, soluble in water, and is precipitated by acetic acid.

ACTION IN THE BODY TISSUES

Meyer (1947) has suggested that connective tissue cells secrete hyaluronic acid and a chondroitin sulphate plus a precursor of collagen into the surrounding tissue spaces. By local acidification in the neighbourhood of the cells the first fibres are produced by the action of the polysaccharides on the collagen. Polysaccharides remain as a layer on the surface of the fibres. The production of hyaluronic acid is probably a continuous process in metabolically active tissue like the skin.

There is no specific histo-chemical test for hyaluronic acid, but the sulphur-containing polysaccharides, such as mucoitin sulphuric acid and chondroitin sulphuric acid, stain metachromatically with toluidine or methylene blue. The biological function of hyaluronic acid and similar polysaccharides appears to be mainly architectural; for instance, combined with protein, as in the ground substance of cartilage, or as hyaluronic acid in a semifluid or a viscid medium. The most economical way of evolving bulk and viscosity is by polymerizing hexoses and sustaining them in water to form either a refractive medium, synovial fluid, or the undifferentiated ground substance of the intercellular space. Quantitative or qualitative changes in the amounts of hyaluronic acid are important factors conditioning tissue permeability.

The ability to increase the tissue permeability, that is, to produce "spreading activity", is exhibited by certain types of pneumococci, hæmolytic streptococci and extracts of such organs as the testes, spleen, ciliary body and iris. Similar spreading activity has also been demonstrated in snake venom and bee venom. Chain and Duthie (1940) and Duran-Reynals (1929) identified the spreading factor of testicular extracts and bacteria with the activity of an enzyme or enzymes which was known as hyaluronidase. Hyaluronidase is one of the mucolytic enzymes which act on mucoproteins.

Hyaluronidase acts on hyaluronic acid, which is therefore its substrate. It also acts on the polysaccharide of the cornea and cartilage. It may therefore be that this substance represents a number of enzymes rather than one, and this is further suggested by the fact that there is some difference in the activity of testicular hyaluronidase on hyaluronates from different sources. Hyaluronidase and other mucolytic enzymes increase tissue permeability largely by reducing its viscosity. They do this by breaking down the chemical linkages of the large asymmetrical polysaccharide molecules. The first phase of this process is known as depolymerization and the final breakdown is of the nature of a hydrolysis. This reduction into simpler molecules effects a physical change in the ground substance, which becomes less viscid and more permeable.

TESTS FOR ACTIVITY

Hyaluronidase is normally obtained from extracts of testicular tissue, particularly bull testes. Its activity can be tested *in vitro* by physico-chemical methods of which three are described:—

(1) ***The viscosity reducing method.***—One unit of the enzyme is defined as the amount required to reduce viscosity of the substrate mixture to 50 per cent. within thirty minutes.

(2) ***The mucin clot prevention.***—Native hyaluronic acid in an acid solution precipitates with protein to form a typical mucin clot. Incubation with hyaluronidase first reduces the clot, and the precipitate ultimately clears.

(3) ***The turbidimetric method.***—This method is based on the fact that polymerized hyaluronic acid forms a clear solution with dilute serum, whereas pure hyaluronate is turbid.

In vivo activity can be tested by the spreading reaction.

A dye, such as Indian ink, is injected subcutaneously. Normally after such an injection, a bleb remains and the ink diffuses very slowly. If hyaluronidase or other spreading factor is injected along with the dye, the bleb flattens immediately, and the dye spreads through the skin as fluid dropped on a blotter. If the animal, usually a rabbit, is killed twenty minutes after the injection, the minimal diffusion dose is the least amount of the enzyme which will produce a 20 per cent. increase in the average area of spread. If the animals are killed twenty-four hours after the injection, it is found that the ink has penetrated into the fascia and even into the muscle underlying the injected site. This spreading reaction can be obtained by other non-specific agents.

THE PHYSIOLOGY OF HYALURONIDASE AND HYALURONIC ACID

Hyaluronic acid has been extracted from the vitreous and aqueous humour of the eye in various animals, and hyaluronidase has been recovered from the ciliary body and the iris. There is some evidence for the constant production of hyaluronic acid in the eye and its removal presumably by enzymatic hydrolysis. It is quite possible that this mechanism is in some way concerned with the maintenance of the normal ocular tension, and the condition

of simple glaucoma may well be related to some upset in the hyaluronic-acid-hyaluronidase enzyme system. The polysaccharide of the corneal ground substance (mucoitin sulphuric acid) shows metachromatic staining in virtue of the sulphuric acid radical. The refractory media of the eye are avascular, and the continuous process of formation and breakdown of the polysaccharide of their ground substance may well have a nutritional significance.

The viscosity of synovial fluid varies in the different joints of the body. The variable factor is probably the amount of hyaluronic acid secreted by the cells of the synovial membrane. Hyaluronic acid, like other asymmetrical molecules, increases the erythrocyte sedimentation rate *in vitro* or after intravenous injection, and it has been shown that purified testicular hyaluronidase decreases *in vitro* the sedimentation rate of blood in patients, particularly in rheumatic fever. This reaction, however, is not due to hyaluronidase, but to spherocyte formation caused by enzymatic action of unknown nature.

Large quantities of hyaluronic acid can be obtained from skin and umbilical cord, with, in both cases, an equal amount of chondroitin sulphate. There is also a large concentration of hyaluronidase in the skin, and this may indicate a fairly rapid production and destruction of hyaluronic acid. This turnover is influenced by certain hormones; for example, Lurie and Zappasodi (1942) found an increased spreading activity in rabbits treated with luteinizing hormones. Others (Sprunt and McDearman, 1940) report a decreased spreading activity under the influence of follicular hormones, which may be of significance in the œdema of the sex skin of monkeys during œstrus. In the turgescent sex skin of the baboon during menstrual cycles there is no free fluid, but water is bound by hyaluronic acid.

Hechter (1946) states that the purified testis hyaluronidase acts specifically upon the hyaluronic acid of the skin and does not affect other mucopolysaccharides, such as chondroitin sulphate. This does not, however, hold for other tissues, where the enzyme has been reported to hydrolize the polysaccharide of cornea and hyaline cartilage. It has been shown that after injection of spreading factor the skin barrier is reconstituted by the production of new hyaluronic acid. Restoration is complete after forty-eight hours.

BIOLOGICAL FUNCTION OF TESTICULAR HYALURONIDASE

The final story of the rôle of testicular hyaluronidase is the result of a great deal of research, and full information may be obtained by reference to the work of Pincus and Enzmann (1935), McClean and Rowlands (1942), Fekete and Duran-Reynals (1943), and Swyer (1946).

The shed ova carry with them into the Fallopian tubes a thick covering of follicular cells which are cemented together by a sticky viscous substance. The cementing substance, holding the sticky mass of cells tenaciously together, is a polysaccharide, and the function of the hyaluronidase is to act

on this polysaccharide, loosen and disperse the covering follicular cells, and so permit early fertilization of the ovum by the sperm. For example, without fertilization, that is, in the absence of hyaluronidase, these covering cells adhere to the ovum for six to eight hours, whereas following fertilization, i.e., in the presence of hyaluronidase, they disperse in about two hours. The absence of hyaluronidase from the testes of birds, amphibia and reptiles, is correlated with the lack of any capsule of follicular cells around their ova.

It is generally agreed that the testicular hyaluronidase is secreted by active seminiferous epithelium and conveyed to the site of action in the sperms, which therefore merely liberate the preformed enzyme. In a general way, the concentration of hyaluronidase is in proportion to the sperm count: the greater number of sperms present, the higher potential concentration of hyaluronidase. In fact, it has been suggested that the large number of sperms *per ejaculate* is to some extent determined by this fact. There is no special stimulus for the liberation of hyaluronidase, and there may be a leak of the enzyme into the seminal fluid. There is no hyaluronidase in the cryptorchid or prepubertal testes. The testicular hyaluronidase has no effect on the mucous plug in the cervix, but this is probably acted on by another enzyme in the semen.

HYALURONIDASE AND HYALURONIC ACID IN BACTERIAL INFECTION

The permeability of the connective tissues will in part regulate the spread of infection and control the degree of invasiveness of the responsible organisms. Therefore to this extent it can determine susceptibility to infection. An animal with a high tissue permeability should have a higher susceptibility to any infection to which the species is liable, and *vice versa:* for instance, experiment shows that young hosts, with their greater tissue permeability, develop infection more severely than adults. This is, of course, only one factor in reaction to disease. Among the pathogenic bacteria, groups of streptococci, staphylococci, pneumococci and *C. welchii* secrete a spreading factor similar to testicular hyaluronidase. This promotes hydrolysis of the mucoid ground substance of the invaded tissue, which increases its permeability and permits greater and more rapid spread of infection. Under experimental conditions bacteria and viruses injected along with a spreading factor have an enhanced local primary effect. This is entirely quantitative and does not promote new conditions or overcome a natural resistance. Other bacteria including groups of streptococci and pneumococci possess a mucoid capsule consisting of hyaluronic acid. Hyaluronic acid is non-antigenic, and thus under the protection of its capsular neutrality the organisms flourish and divide, immune for a time from the host-defence mechanism. It has been shown that the elaboration of the polysaccharide capsule is associated with the growth phase of the organism. The presence of this capsule therefore greatly increases the virulence of these bacteria. There is some evidence that capsular organisms can also secrete hyalur-

onidase and, like the skin, possess a polysaccharide turnover. Other enzymes in crystalline form are antigenic, and although spreading factors have not yet been obtained in the pure state, the crude extracts can produce antisera capable of suppressing the *in vivo* and *in vitro* activity of the enzyme; for example, rabbit antisera can be obtained against rat or bull testicular extracts, which will suppress the spreading power of the extract, neutralize its ability to enhance vaccinia infection, and prevent the hydrolysis of hyaluronic acid. The antisera are specific for the source of their production. Some of the therapeutic effects of antisera in general may well be partly, at least, due to their anti-spreading properties.

HYALURONIDASE AND HYALURONIC ACID IN PATHOLOGY

In the rheumatic group of diseases there is undoubtedly some change in the ground substance of the various connective tissues, and it is possible that the hyaluronic-acid-hyaluronidase mechanism is upset. It is known, for example, that although synovial fluid from rheumatoid joints contains an excess of hyaluronic acid it has also an excess of hyaluronidase, and therefore lower viscosity. Experimentally, hyaluronidase injected into a joint cavity lowers the viscosity of synovial fluid but does not by itself cause injury to articular cartilages or synovial membrane, or any permanent derangement of previously healthy joints. The normal chemistry of the mucoproteins of skin connective tissue is probably disturbed in such conditions as myxœdema, ganglionic and mucous cysts.

Hyaluronic acid and allied polysaccharides, in contrast to hyaluronidase, are strictly non-antigenic, and tissues with an abundance of mucoprotein ground substance enjoy longer survival powers as homografts. For example, epithelial tissues normally do not survive transplantation to another individual and are generally totally destroyed within twenty-one days, whereas in tissues such as skin, especially if the graft includes a fair amount of connective tissue, the rate of destruction is slowed down and there is a longer survival period. Where the tissue consists almost wholly of mucoprotein ground substance, for example, hyaline cartilage, cornea or the lens of the eye, they "take" as homografts and can be so used clinically. It has been suggested that these survive because they are avascular and do not require to be incorporated within the host vascular system, but this by itself would not suffice if the mucoproteins were antigenic, in which case the host antibodies would reach the graft by way of the tissue fluids and destroy it (Bacsich and Wyburn, 1947).

THERAPEUTICS

Sterility.—It is possible that deficient hyaluronidase is an occasional cause of male sterility. This is likely to be associated with a low sperm count, but the accompanying enzyme deficiency may be a significant factor. Attempts have been made in such cases to produce a fertile mating by application of

hyaluronidase to the cleaned cervix before coitus, or by the addition of hyaluronidase to the faulty semen before artificial insemination. Successes have been reported.

Antisera formed against bull testes' hyaluronidase can inhibit or prevent dispersal of follicular cells of rat ova *in vitro*, although ova from immunized rats are affected by hyaluronidase at the same rate as normal ova. It seems possible that some types of female sterility previously attributed to "sperm immunity" may be due to antibody formation against hyaluronidase. Some of these suspected cases have had their sera tested against bull testes' hyaluronidase for increased inhibitory action, with negative results. Considering the species-specificity of hyaluronidase, this is of little significance, and the sera would require to be studied against human testes' hyaluronidase.

Aid to subcutaneous administration of fluids and drugs.—Hyaluronidase has been used to facilitate and hasten the absorption of contrast media when intravenous injection is difficult or contraindicated, for example, in infants. In this field there are indications for its use in urography in infants, e.g., an injection of 2.5 units of hyaluronidase before administration of the contrast media, promotes more rapid absorption, less swelling, and absence of pain or any sense of tension. Pyelograms, both in adults and infants, were as satisfactory as those made by intravenous injection. Such a technique could also be applied for X-ray examination of soft parts. Preliminary injections of hyaluronidase have been used to accelerate the absorption of hypodermically administered fluids, whether physiological saline or plasma, in cases in which intravenous injection is impossible (Gaisford and Evans, 1949). The effect of hyaluronidase lasts for twenty-four hours. In this way hyaluronidase has also been used with local anæsthetic agents for different types of nerve block.

Other less well-established indications for the use of hyaluronidase are: to aid the removal of viscid exudates from peritoneal or pleural cavities; injection into ganglionic and mucous cysts and into the cavities of pathological joints to lower the viscosity of the exudate.

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REVISION CORNER

TREATMENT OF RINGWORM OF THE SCALP

THE contagious character of ringworm of the scalp has long been recognized. It is essentially a disease of children, especially those of school age, the incidence being highest usually between the age of six and seven. For this reason it interferes with education, particularly in the important early years of school life. The infection is most often sporadic but now and then assumes epidemic proportions. The latter is accounted for by two main causes: (1) a periodic biological increase; (2) spread due to failure to detect early cases in schools or orphanages.

Control of these early cases, in the past not easily accomplished, has during more recent times been greatly helped by two factors: (1) the introduction, in 1903, of Wood's filter lamp—a filter composed of a glass with barium and nickel oxide components which, used in conjunction with ultra-violet light, reveals a green fluorescence of the hairs affected with the common cause of ordinary scaly ringworm of the scalp; and (2) the growth of the School Medical Service. There can be no doubt that regular medical inspection at school has been responsible for detecting many early cases of scalp ringworm. This service has been further enhanced in many areas by the formation of units specially trained and equipped for controlling and treating the disease.

In discussing treatment it is wise to recall (1) that from 10 to 27 per cent. of cases tend to recover spontaneously; (2) that the human type of infection is apt to die out at puberty; and (3) that those cases due to infection from animal sources respond most readily to topical therapy. Thus treatment in general is somewhat governed by the above-mentioned factors before assessment or comparison can be made of particular forms of therapy. A note must here be added concerning the second observation, that up to date, hormonal therapy has proved of no value. Treatment may be divided into three main parts: (1) manual epilation; (2) epilation induced by X-ray irradiation or by thallium acetate by mouth; (3) the topical use of fungicides.

MANUAL EPILATION

Manual epilation has been practised throughout the ages, and the skull cap of pitch plaster of Heliodorus found favour until the early twentieth century. It has been shown recently that by itself, manual epilation, carefully and methodically performed, can give more than 50 per cent. of cures. By most workers it is still used, either directly or indirectly, as an adjunct to topical therapy, and even after X-ray irradiation. There is no doubt, and most authorities agree, that the routine and intensive use of manual epilation under Wood's glass filter, hastens and increases the potential cures ascribed to modern fungicidal agents. With the removal of the diseased hairs the follicles become more easy of access to the therapeutic agent used and greater penetration is obtained. Manual or mechanical epilation is achieved by the use of forceps, ordinary washing, friction by a small brush to rub in the application chosen and, in addition, by the use of adhesive therapy following loosening of the hairs by X-ray irradiation or after thallium acetate administration.

X-RAY EPILATION

Of epilation induced by X-ray irradiation or by the administration of thallium

acetate by mouth, the latter is now mainly restricted to a few cases: to the more restless children below school age, in whom X-ray irradiation would be difficult to control. By and large, however, thallium acetate has fallen into comparative disuse because of its potential toxicity, particularly now that X-ray irradiation technique has become improved and more readily available. It must be remembered that X-ray irradiation is not in itself fungicidal; it merely induces a temporary and fairly rapid hair fall—usually within three weeks—the fungus coming away with the loosened hairs. Recent work has shown that without adjuvant therapy, and using only soap and water cleansing after the fifteenth day, at least 87 per cent. of treated cases remained clear.

X-ray epilation must be carried out at units specially equipped and trained in the necessary technique. This consists of shaving the whole scalp and delivering a predetermined number of Röntgen units to five areas of the scalp (the so-called five-point or Adamson-Kienbock method): this is so delivered to the convex contour of the scalp that the fall off in dosage at the periphery of each area treated is overlapped by the irradiation of each adjacent area, and thus an almost uniform dosage for the whole surface is achieved. The hair loosens at the end of about two weeks, and its removal can be assisted by the use of slightly heated adhesive strapping. As already mentioned, however, this would seem to be unnecessary if careful and vigorous washing is carried out.

FUNGICIDAL AGENTS

This, from the practitioners' point of view, is probably the section of greatest interest. In less recent times it was restricted to the use of iodine, or salicylic acid with benzoic acid or an ester of the latter. Success was variable and cure usually slow. More recently, however, the use of *iodine* has been resurrected. Strickler's method of using a complicated iodine compound in cotton-seed oil with a special wetting agent, following acidulation with 3 per cent. acetic acid, is a reminder that iodine is still a useful fungicide and can produce 70 per cent. of cures in three to three-and-a-half months.

Within recent years research into agents with fungicidal properties has introduced many new substances, particularly in the United States. The application of some of these has been instituted and investigated in this country within the past year or so. After many experiments it has been demonstrated, however, that high *in vitro* activity provides little indication of possible *in vivo* efficiency. It has been made clear, on the other hand, that therapeutic efficiency depends upon penetrative ability, consequently the vehicle or base employed is of extreme importance.

The most effective of the newer preparations include *phenylmercuric nitrate*, 0.5 per cent., with Crill No. 6 in carbowax 1500; *salicylanilide*, 5 per cent., hyamine 1 per cent. in carbowax 1500; and *copper undecylenate*, 5 per cent. in carbowax 1500. These compounds are used in the time-honoured way associated with older preparations: shaving of part or all of the scalp; repeated and thorough washing; careful and efficient application of the chosen medicament with the aid of a toothbrush; the usual precautions, by means of paper or linen linings for caps, to prevent transmission of the disease by infected hairs. And yet there would seem to be little or no uniformity of results obtained. Some workers claim only a small percentage of cures; the greater number, however, claim a varying high percentage of good results.

It cannot be denied, and indeed it is affirmed, that whatever form of therapy is chosen the main essential is the thoroughness with which the treatment is carried out and contributors to the present-day newer methods admit that epilation, be it by forceps, washing or friction with a brush, plays a not inconsiderable part in achieving success. It would seem to be sound advice that if local therapy by fungicidal measures fails after three months, X-ray epilation must be considered.

CONCLUSION

In conclusion, it must remain a reflection on present-day medicine that no specific cure has so far been found, and it must be the fervent hope of all that some new and safe antibiotic may yet be discovered that will solve the difficult problem of ringworm of the scalp.

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RINGWORM OF THE NAILS

THERE is still surprisingly little reliable information available concerning the incidence of ringworm infections in Great Britain. Duncan's (1945) report on the first eighteen months of the "Survey of Fungus Diseases in Great Britain" is an important contribution in this field. The incidence of ringworm of the nails parallels that of ringworm of the feet, although it is much less common. Moreover, ringworm of the nails, as of the feet, is rare before puberty and occurs much more commonly in men than in women. The factors responsible for these sex and age differences are not known, as differing opportunity for acquiring the infection does not fully explain the facts. The toe nails are presumably infected from the neighbouring skin and the finger nails by repeated contact with the skin lesions in scratching. Although the toe nails are more frequently infected than the finger nails, it is usually on account of the unsightly appearance of the latter that the patient seeks advice. Ringworm of the finger nails is, however, often seen without any evidence of foot infection. It is possible that in these patients the foot infection may have been transient. There seems little doubt, however, that from time to time the finger nails may be infected in other ways than from the feet, e.g. manicure.

Another problem in ringworm infection of the nails is the curious way in which one or two nails only may be affected. In common with fungus infection of glabrous skin, the soil seems to be at least as important as the seed.

Ringworm of the feet and groins, and therefore of the nails, which seems to have been uncommon before the first world war, began to increase in incidence during the nineteen twenties. The causative fungi are said to have been introduced into public schools by pupils from tropical and subtropical countries where the infections are widespread. The growing popularity of communal changing-rooms and shower baths, both in connexion with athletic activities and in industry, has favoured their further spread. The return to this country of men infected while serving overseas during the recent war has probably led to a still further increase, and is perhaps responsible for the higher proportion of infections with *Trichophyton rubrum* which has in recent years been noted in this country and in other countries in Europe.

The species of dermatophyte infecting nails confirms the close association between nail infections and infections of the glabrous skin. Of the last ten cases of ringworm of the nails at St. Thomas's Hospital, from which positive cultures have been obtained, six have been due to *Trichophyton rubrum*, three to *Trichophyton mentagrophytes*, and one, in a woman from Eastern Germany, to *Trichophyton schœnleini* (favus). These findings are in general agreement with those of Rockwood (1930) and Montgomery, in the United States, but the proportion of Trichophyton rubrum infections is higher in our series of cases. Duncan found *Trichophyton mentagrophytes* and its sub-species, and *Trichophyton rubrum* and *Epidermophyton floccosum* to be the most common causes of tinea pedis. *Epidermophyton floccosum* infection of the nails seldom, if ever, occurs.

CLINICAL FEATURES

Search should be made for ringworm of the feet, which so often precedes or accompanies ringworm of the nails. The earliest change detectable in the nail plate is an area of white, yellow or brown discoloration at the free edge or lateral border. This area, which is dull and lustreless, slowly increases in size and extends across the plate and towards the matrix. In some cases of *Trichophyton mentagrophytes* infection there may be, even after months or years, no abnormality other than irregular, angular, chalky-white patches, the so-called leuconychia trichophytica.

In most cases, however, and in almost all *Trichophyton rubrum* infections, other changes slowly appear. The affected patches become darker in colour, soft and friable and readily crumble away, giving the nail the appearance of rotten or wormeaten wood. The whole nail plate may be involved in this process of destruction, but it is exceptional for the nail to be completely destroyed, although it may be reduced to a small brown peg. Horny material accumulates beneath the plate and, by raising it from its bed, distorts the direction of its growth, and produces irregular ridging and other deformities. Inflammatory changes in the nail fold are rarely present and usually indicate a coexistent coccal or monilial infection. One or all the nails may be infected, and there may be successive spread from nail to nail. The infection may persist for many years, as spontaneous cure does not occur.

DIAGNOSIS

The clinical diagnosis must always be confirmed by microscopical examination for the presence of mycelium of nail filings, or of horny material from beneath the nail. With a little practice the mycelium is readily identified if the fragments of nail are warmed in 20 per cent. caustic potash and then left to stand for twenty-four hours before they are examined.

In *differential diagnosis*, psoriasis is likely to give rise to most difficulty: fine pitting is the most characteristic change, but there may be destruction of the nail plate, yellowish discoloration and subungual hyperkeratosis. Furthermore, pitting may be absent. The presence of psoriasis elsewhere on the skin, the involvement of several nails simultaneously, may help in deciding the diagnosis. Certain congenital dystrophies result in nail deformity; the symmetrical involvement of all nails, the history, and in some cases, associated dystrophy of teeth and

hair, assist diagnosis. Occupational trauma, mechanical or chemical, may damage the nails severely but the patient is usually aware of the cause. In some generalized dermatoses and in eczematous and infective conditions, e.g. chronic paronychia involving the skin of the fingers, nail changes, particularly transverse ridging, occur, but usually present no diagnostic difficulties. It is perhaps worth pointing out that whereas ringworm first affects the distal portion of the nail, in the majority of other conditions deformity of the nail plate can be produced only by disturbance of nail growth in the matrix, and is therefore first observed near the base of the nail. In moniliasis of the nail there is often associated paronychial infection. Horny white patches are seen in the nail plate, but disturbance is less marked than in ringworm infections.

TREATMENT

The inaccessibility of the fungus in the keratin of the nail renders this condition extremely intractable. The patient demands treatment on account of the unsightly appearance of the finger nails, but the toe nails should also be treated, as they serve as a focus for the repeated reinfection of the patient's skin, and perhaps also as a source of infection of others. Insufficient emphasis has been placed on prevention, which is particularly desirable in a condition the treatment of which is so difficult. The early and efficient treatment of ringworm of the feet will almost certainly prevent the majority of nail infections.

Little will be gained by listing the many treatments which have been advocated; their multiplicity is the measure of their inefficiency. A practical line of procedure is as follows:—

If the nails are deeply infected, and if rapidity of cure is important to the patient, the nails should be removed surgically. The operation must be carried out under expert anæsthesia and every fragment of nail must be removed with meticulous care. The nail bed, which is frequently infected, should be treated with phenol, and dressings with Whitfield's ointment or with iodine ointment should be continued while the nail is regrowing. Even when every care is taken the new nails are sometimes found to be infected, and it is occasionally necessary to resort to complete surgical destruction of the nail beds. Artificial finger nails made of plastic material can be worn if desired.

If the patient is willing to cooperate fully throughout a lengthy period of treatment, or if the infection is very superficial, as much of the infected nail as possible should be removed with a file or with a dentist's burr. Whitfield's ointment should be applied to the nail daily under an occlusive dressing of adhesive plaster, and the patient should be instructed to file the nail twice weekly; thorough débridement is the secret of success. After four months the nail should be allowed to regrow, the application of ointment being continued.

Recently, successful cures have been claimed in the United States (Nickerson, 1948) by weekly paintings of the nails with ammoniacal silver nitrate, which is fungicidal and is said to penetrate keratin. Personal experience of the treatment has been disappointing. Seven cases treated in strict accordance with Nickerson's instructions show no change after six months.

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NOTES AND QUERIES

Regime for Increasing Weight

QUERY.—I have been approached by a farmer patient who is anxious to increase his weight by about 14 lb. (6.3 kg.) in order to compete, on more even terms, in a particular point-to-point race which is due to be run this season. He is in the late forties, height 5 ft. 6 in., normal weight 130 lb. (60 kg.), and of the light-boned type of build. I have examined him medically and consider that generally he is fit to stand the rigours of such a race. This is confirmed by the fact that he still leads a very active life on the farm which is his home. When younger, he indulged in many sports and he still is an accomplished horseman, spending some time in the saddle every day. The only adverse feature in an otherwise healthy life is his large consumption of whisky. He is a moderate smoker. I should be obliged for advice as to how I might guide him.

REPLY.—Although it is possible to increase body weight materially in a comparatively short time by taking various steps which will retard the elimination of fluid, such a procedure would not be advisable for this patient, who clearly wishes to be physically fit at the end of the period. His weight could probably be raised by several pounds in the course of the next few weeks simply by dieting. The trouble is that a heavy whisky drinker seldom has a good appetite, and during the training period he must be persuaded to reduce his consumption of alcohol to two double whiskies a day. The rest is simply a matter of seeing that he eats full meals, especially a good breakfast with bacon and eggs, toast and butter, and porridge, if possible, and the giving of extra feeds between meals. The best feeds for this purpose consist of milk: a tumblerful taken at say 11 a.m., 6 p.m., 9 p.m., and bedtime should help to supply the necessary requirements.

A. H. DOUTHWAITE, M.D., F.R.C.P.

Toxic Reactions to Gold Therapy

QUERY.—I have two cases of rheumatoid arthritis on myocrisin injections. Both have benefited markedly by the treatment. The first, a man of forty-seven, is on the eighth dose of his first course. The second, a woman of twenty-six, is on the third dose of her second course. The myocrisin used is the aqueous solution and the usual doses have been given, starting with 0.01 g., 0.02 g., and following with 0.05 g. at weekly intervals. Both have had a severe general reaction with the last dose given, followed by an irritable dermatitis of the shoulders, chest and back. I should be grateful for advice as to whether (a) the course of injections should be continued in spite of the dermatitis; (b) continued after an interval, if so, how long?; (c) continued with small dosage (for example, myocrisin 0.005 g.); or (d) discontinued altogether.

REPLY.—A sudden onset of toxic symptoms may arise with any gold preparation at any time and on any dosage, but more commonly on the higher dosage. The more serious changes, thrombocytopenia and agranulocytosis, call for complete cessation of treatment. A slight albuminuria without hæmaturia, temporary increase in joint symptoms or slight fever, require reduction of dosage only. A slight dermatitis, other rashes such as those due to sweating or seborrhœa being excluded, comes into an intermediate category. It is usually best to stop gold injections for a month, and then, if all signs of the rash have disappeared, to continue with a minimal dose of 0.005 g. myocrisin, giving at the same time 2 ml. collosol calcium and two benadryl capsules on the evening of the injection. The dosage may then be gradually built up again. The value of calcium given with gold to reduce toxic complications is not proven, but personally I think it is a useful adjunct to treatment.

If the rash does not subside within a few weeks or tends to spread, BAL (British antilewisite) should be used at once, its effect being to inactivate any gold in the system. The usual course consists of four injections of 2 ml. on the first day, three for the next three days, and then one daily for the last three days of the course. A few cases are, or become, quite intolerant to gold, and for these copper may be of value. It is less powerful in its effect, but also certainly less toxic.

G. D. KERSLEY, M.D., F.R.C.P.

Pyuria following Nephritis

QUERY.—Cases of acute nephritis in children often seem to reach a stage when casts disappear but pyuria persists. What treatment is recommended for this persistent pyuria?

REPLY.—Usually, in children, the casts disappear in the urine first, then the white cells, next the albumin and finally the red blood cells, but the number of epithelial cells and cells resembling pus cells varies in different cases. They are usually less than the red blood cells but there are some cases in which they are as numerous. Their relation to the number of casts of epithelial type is not entirely fortuitous. Many may have

originated in epithelial casts which are made from cellular elements from the renal tubules cemented together with albuminous material. When the albuminous material decreases, the casts tend to break up more easily and so are often missed. Finally, only individual cells are excreted. The important point is not the casts but the epithelial cells from which they are made. Hyaline casts are of small import. An attempt should be made to distinguish these small single nucleated epithelial cells from the polymorphonuclear pus cells. The persistence of many genuine polymorphonuclear pus cells suggests the addition of an active infection of the pelvis or bladder to the original nephritis. This may give a positive culture. If this is found to be the case, treatment of the pyelitis or cystitis on the usual lines can be undertaken. The use of sulphonamides is not contraindicated so long as there is a good flow of urine. If, on careful microscopy, the cells are seen to be mainly epithelial, together with some red blood cells, it indicates that the nephritis is still active. There is no specific treatment other than that usually adopted in nephritis.

W. W. PAYNE, M.B., M.R.C.P.

Care of New-Born Children of Diabetic Mothers

QUERY.—I would be grateful if you could let me have some ideas on the care of a new-born baby whose mother is a severe diabetic. Should precautionary treatment be instituted automatically, or only if signs and symptoms develop?

REPLY.—It is known that the blood sugar of babies born to diabetic mothers may fall to a very low figure during the first few hours after delivery and, as a precautionary measure, many people give these babies glucose for the first twelve hours of life. This procedure is not without danger, and it is probably best and safest to give the glucose by mouth with a dropper, eight drops of a 50 per cent. solution being fed every half-hour for the first four hours and subsequently every hour for a further twelve hours. No other precautions are necessary, and such babies, if they survive the neonatal period, grow and develop normally.

W. G. OAKLEY, M.D., F.R.C.P.

Baby Scales

QUERY.—I would be grateful for advice on a matter of purchase. I wish to buy a baby's scales for use in my surgery, and also for the purpose of loaning out to mothers (free, of course). I have made this decision fully aware that there are other facilities for this in the local clinic and through the district nurse. I assume that there is no question as to the greater degree of accuracy being obtained with the balance and weights, but in order to avoid the greater expense of this type, would it be a reasonable economy to buy a spring balance? If any particular type is recommended, I would be pleased to know of it.

REPLY.—The only reliable baby scales are the pan and balance with separate weights. Test feeding is never possible on a spring balance because of the baby's movements. John Bell & Croyden, Wigmore Street, London, W.1, supply good scales; or they can now be obtained from the manufacturers direct. They should have a plain white enamel pan and not a basket as the latter will alter in weight in the course of time. Here are two hints from someone who has been lending out scales for twelve years:—

(1) Put the small brass weights in a tin and paste a list of the weights therein on the lid to minimize the risk of losing an odd weight.

(2) As an addition to such scales for loan to *difficult* feeding cases, I have found it expedient to carry a pair of pocket spring scales and hang up the baby in a napkin. This is quite sufficient for the purpose of ascertaining an approximate weight in normal cases in the third and fourth weeks after delivery, before the mother is well enough to come to the surgery. (Almost constantly the indoor clothes of such a baby with a towel napkin on, and suspended in a towel napkin, weigh 12 oz.)

The ideal armamentarium of the doctor interested in the progress of babies (a wise man!) is: (a) a pair of small portable spring scales in his bag (5s. 6d.); (b) a pair of pan and balance scales (£8 10s. 0d.), (or spring scales (£2) for economy) in the surgery; (c) a pair of accurate pan and balance scales to lend out to patients in their homes (approximately £8 to £12). (Avery scales to 28 or 56 lb. were £5 pre-war.)

CHARLOTTE NAISH, M.D.

Endotracheal Intubation

QUERY.—I have been surprised by the freedom with which intratracheal intubation is employed in anæsthesia—as often, it seems, for the prestige of the anæsthetist as for the benefit of the patient. Does not the passage of such a tube (often through an infected nasal cavity), as a potentially infected foreign body inserted into the trachea, increase the risk of postoperative pulmonary infection? Should such tubes be sterile? (apparently they seldom are).

REPLY.—There is a tendency on the part of some anæsthetists to use endotracheal intubation far too often. Sometimes this is due to over-enthusiasm, and in my opinion nasal intubation is only called for when operations are proposed

in the mouth or the pharynx, such as tonsillectomy, partial glossectomy, or extraction of wisdom teeth. As a matter of fact, it was shown by some American statistics that the incidence of postoperative pulmonary complications was slightly higher after nasal intubation than after oral intubation. As regards sterilization: my practice is to boil the endotracheal tubes before use, but there are many anæsthetists who use Magill's method of immersion in 1:4000 biniodide of mercury before use. My own impression is that as one grows older and more experienced, there is less endotracheal intubation.

FRANKIS EVANS, M.B., D.A.

Stammering in an Adult

QUERY.—What is the modern treatment for stammering in an adult male? Can hypnosis play any part?

REPLY.—In the case of adults the psychiatric approach is the same in principle as that used in other functional disorders. Stammerers, however, are apt to be over-tense, and narcosis with thiopentone sodium helps relaxation and enables further exploration of the mind. Hypnosis is also an excellent method of inducing relaxation in suitable subjects. In addition to psychiatric treatment, the patient should attend a speech therapy clinic, of which there are a number in the London area.

A. SPENCER PATERSON, M.D., F.R.C.P.ED.

Medical Partnerships and the National Health Service Act

QUERY.—Perhaps you could help me with a question on the National Health Service. I am in partnership with another doctor in the Provinces. Our agreement was drawn up prior to the National Health Service. In this agreement it was stipulated that I should draw two-fifths and my partner three-fifths of our profits for three years. At the end of this time I should be allowed to exercise the right to purchase up to fifty per cent. of the business at one-and-a-half years of the average gross receipts for the past three years. I have been in partnership for three years and now wish to increase to fifty per cent. my share of our profits. By law I am not allowed to purchase goodwill. I believe that legislature has been passed to cover such an agreement as ours but I know little about it. I should be most grateful if you could tell me what to do or if you could give information or advice on this matter. My partner knows as little as I do about the correct procedure which we should adopt.

REPLY.—Assuming that your correspondent and his partner are practitioners whose names are entered on the medical list of the local Executive Council the situation described is met by the National Health Service (Amendment) Act, 1949. The additional share should be transferred from the vending to the purchasing partner as a free transfer without the passage of any money between them on this count. The contract price of the goodwill thus purchased shall be deemed to have been satisfied by the credit to the vendor or his estate of the compensation payable in respect of that share thus transferred with the payment in addition of the interest thereon. Furthermore, the compensation related to the fraction of the share thus transferred becomes immediately payable when a transference has been effected. It can be presumed that the compensation payable to the vendor on his death or retirement has already been settled to the extent of the assessment of the annual loss as required by the compensation regulations. The foregoing transaction will mean that the vendor will receive one-sixth of his total compensation shortly after the transference to his partner of one-sixth of his share holding. The vendor is therefore paid by the State instead of by his partner for the transfer he is obliged to effect under the terms of the Partnership Deed.

ROBERT FORBES, M.B., CH.B.

PRACTICAL NOTES

Removal of Freckles

A METHOD of treatment which is stated to result in permanent removal of freckles is described by L. Winter, of the 1st Surgical Clinic, Pázamány Péter University, Budapest (*British Journal of Dermatology and Syphilis*, February 1950, **62**, 83). The method consists in the application at room temperature of a mixture of 20 to 30 per cent. pure carbolic acid in ether. The technique is as follows:—

With the patient in the recumbent position the area of skin to be treated is cleansed by swabbing with ether. In treating the face the eyes are protected by moist cotton-wool swabs kept in place with liquid paraffin. A mixture of 25 per cent. liquefied carbolic acid in ether is prepared in a test tube (sufficient for a single treatment, containing a maximum of 1 g. phenol); a piece of cotton-wool is soaked in the liquid and applied to the skin without rubbing. The operator wears rubber gloves to protect the hands.

At the moment of application there is a sensation of burning, but not an unbearable degree of pain (the immediate pain is controlled by analgesia, but not morphine or its derivatives as they may mask any toxic symptoms). Two minutes after application the skin becomes a vivid red and then deepens in colour; the

freckles become dark brown and increase in apparent number and the surrounding skin later becomes copper coloured, with some œdema. After forty-eight hours these local symptoms disappear, the skin is parchment-like, and the freckles a deeper brown. The skin becomes dry and shrivelled and on the fifth to sixth day cracks and peels off, the freckles coming away with the scales, and leaving the skin smooth, rosy-coloured and healthy. In addition to the immediate burning sensation, symptoms in the form of pallor, slight dizziness, lassitude and malaise may occur; these pass off within fifteen to twenty minutes. Immediately after the treatment a stimulant, such as coramine or cardiazol, should be given to prevent or mitigate such possible symptoms. It is stated that "Apart from these immediate effects there are no harmful or painful consequences, no dressings are required and patients are able to carry on a normal life . . . Removal of freckles is permanent; even in cases treated nearly eight years previously there has been no recurrence".

Toxic and Allergic Reactions to Calomel

RECORDING a number of cases from the literature of toxic and allergic reactions to calomel, P. E. Morhardt (*Presse Médicale*, February 18, 1950, **58**, 159) gives the symptoms recognized by Dr. Fanconi, Professor of Pædiatrics, University of Zurich, who has named the condition "*maladie du calomel*". The reactions most often observed are in the form of an acute exanthem, with small scarlatiniform or urticarial eruptions on the body, excepting the palms of the hands and soles of the feet; abdominal pain and diarrhœa; elevation of temperature; or there may be an acute eczematous type of dermatitis. These symptoms occur on an average within six to eight days of taking the drug, disappear within a few days, and do not affect the general health. Details of two cases are given in which the children had been treated for ascaris by administration of santonin and calomel: in one case 0.015 g. of calomel with santonin, in two doses twenty days apart, and in the other 50 mg. of calomel in two doses, three and two months before the occurrence of the symptoms. Treatment of the condition consists in the administration of BAL by injection; in the second recorded case it was given in dosage of 2.5 mg. per kg., four-hourly and then six-hourly, for twelve days. On the evening of the first treatment day the child's urine contained 360γ of mercury per litre, on the next day 400, and the following day 240, thereafter decreasing, until on the thirteenth day when the BAL was stopped the content was only 10γ of mercury per litre of urine. The author concludes with the advice of Baumann (*Schweiz. med. Wschr.*, 1949, **79**, 721, 750) "to eschew the mercurials in infants, and particularly to renounce calomel, laxatives such as castor oil and phenolphthalein being preferable, because their innocuousness is more certain".

The Hydraulic Method for Delivery of Retained Placenta

A METHOD for delivery of the retained placenta without introduction of the hand into the uterus is described by C. D. Bradley (*American Journal of Obstetrics and Gynecology*, January 1950, **59**, 141). Equipment required is: a large-gauge needle with short bevel or blunt end, a large syringe, several hæmostatic forceps, and 1000 ml. hot sterile normal saline solution (in emergency this can be prepared in any kitchen by adding one rounded teaspoonful of table salt to one quart of tap water which is boiled for ten minutes). The technique is as follows:—

The needle is inserted in the umbilical vein of the cord as for intravenous injection, and clamped with one or two hæmostats to keep it in place and prevent fluid from escaping from the cord (fig. 1). 500 ml. of *hot* (125° F. [52.5° C.]) sterile solution are injected briskly (while the syringe is being refilled the cord must be compressed between the finger and thumb of an assistant to prevent escape of fluid back through the needle). The injection completed, a hæmostat is clamped on the cord between point of injection and vulva, to retain fluid in placental circulation. If, after fifteen to twenty minutes, the placenta has not been delivered, spontaneously or by pressure on the fundus, manual removal should be carried out without delay. The cord should be injected far enough away from the vulva to leave sufficient length for second insertion of needle. If the fluid runs out of the vulva as fast as it is injected, this indicates rupture of the placenta, as when attempts have been made to express it by the Credé method, and further injection is useless and even dangerous.

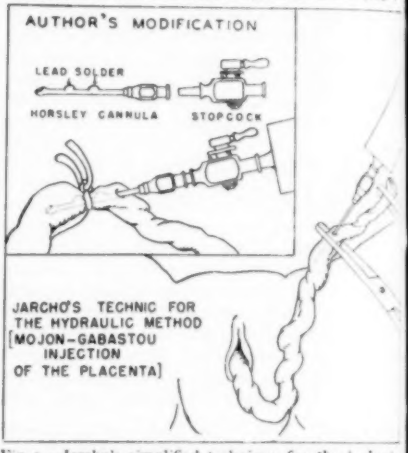

Fig. 1.—Jarcho's simplified technique for the hydraulic method (Mojon-Gabastou injection). The inset shows the author's modification which makes for greater ease of injection and requires no assistant.

Advantages claimed include: (1) its simplicity; (2) no anæsthetic is required; (3) success rate of 70 to 90 per cent.; (4) if injection fails, manual removal may be proceeded with immediately, and with greater ease. The injection of the hot solution causes the placenta to become larger, firmer and heavier; the increase in size completes separation from the uterine wall, and the increased size and weight stimulate uterine contractions, which are further stimulated by the heat of the injected fluid. The patient complains of cramping pain in the abdomen, the uterus becomes hard, the fundus rises, and often there is a gush of saline and blood from the vulva and the placenta is either expelled spontaneously, by fundus pressure, or manually with greater ease owing to the increased thickness and firmness of the placenta. The method should be used early before clotting of blood in the placental vessels has taken place. "The hydraulic method is indicated in (a) retained placenta with no bleeding and (b) retained placenta with only slight bleeding. It must not be used where retained placenta is associated with profuse bleeding or shock due to previous blood loss . . . The hydraulic method is the treatment of choice for retained placenta in the presence of eclampsia because the eclamptic patient withstands general anæsthesia and shock poorly".

Wettable DDT in Pediculosis

"WETTABLE DDT powder (55 per cent.) is an effective remedy for pediculosis" writes G. E. Morris (*New England Journal of Medicine*, November 10, 1949, **241**, 742). The type of DDT powder employed was a fine, smooth, white fluffy powder in strength of 55 per cent. active ingredient, which when mixed with water forms, on agitation, a soapy emulsion. The part affected is wetted with water, a lather is made with the wettable DDT, and this is allowed to remain on the affected parts for fifteen minutes and then washed out with water. The treatment is repeated once weekly for three weeks, by which time further hatchings from the nits will be completely destroyed. There is immediate relief from itching after the first treatment. All members of an infected household should be treated at the same time, and for eradication of lice from institutions or hospitals all persons, including personnel, should be treated once weekly for three weeks, and all new patients for the first three weeks after admission. If wettable DDT is not available a paste of equal parts of 55 per cent. DDT powder with one of the newer synthetic shampoos or detergents may be employed in the same manner. When using wettable DDT powder: 15 g. (1 tablespoonful) is enough for the average male scalp, 60 g. (4 tablespoonsful) for the average female scalp, 15 g. for each treatment of pediculosis pubis, and 120 g. for a tubful of clothing, a single treatment of which followed by ironing with a hot iron is sufficient to eradicate the lice. No case of dermatitis following the use of wettable DDT and no toxic metabolic reactions have been observed by the author over a period of two years, during which time it has been used with "unprecedented success".

Herpes Zoster and Chickenpox

THE following data reported by H. E. Seiler (*Journal of Hygiene*, September 1949, **47**, 253) are based upon a study of 246 cases of herpes zoster which occurred in Edinburgh in 1947-48. This was calculated to represent a yearly incidence of 2 per 1000 of the population. When related to the population as a whole, no sex differentiation was found. Sixty per cent. of the patients were over the age of forty-five years. The anatomical distribution of the eruption was dorsal, cervical, or supra-orbital in 88 per cent. of cases; of all, the dorsal region was involved most often—in 53 per cent. of cases. There was no preference for either side of the body. Motor paralysis occurred in only one patient. Five patients gave a history of recent trauma prior to the onset of the herpes. In only six out of the 184 cases fully investigated was there a history of direct contact with chickenpox before the onset of herpes zoster, and other infective diseases, such as mumps and measles, occurred in approximately the same proportion. "A chickenpox condition" following contact with herpes zoster occurred in connexion with 10 (5.4 per cent.) of the patients, and 11 (2.7 per cent.) of 442 family contacts were affected. With one exception, the affected contacts were young children and the eruption developed within the usual incubation period of chickenpox. Among the contacts with no previous history of chickenpox the proportion who developed "a chickenpox condition" rose to 8.1 per cent., whilst among the 71 susceptible contacts under fifteen years of age the proportion rose to 15.5 per cent. The conclusion is drawn: "It is considered that the evidence does not favour a significant association with chickenpox prior to the onset of herpes zoster, but that the facts are consistent with the view that a condition indistinguishable from chickenpox may follow contact with herpes zoster. It is suggested, however, that this may be a generalized manifestation of the virus of zoster rather than true chickenpox".

Allergy to Plastic Artificial Eyes

IN a series of 100 patients fitted with a plastic prosthesis, J. Macivor (*Canadian Medical Association Journal*, February 1950, **62**, 164)

reports eight cases of contact allergy. Six of these patients had been fitted with plastic artificial eyes and two with partially exposed plastic implants. In each case a burning sensation developed in the socket within fifteen minutes to twenty-four hours of insertion of the plastic eye, and within twenty-four hours the socket conjunctiva had become reddened and œdematous, and a discharge had collected. Removal of the plastic eye relieved the symptoms and signs, and they did not recur when a glass eye was used. Infection was excluded as a possible cause of the irritation and discharge. Patch tests on the forearm were positive in only two cases, but in all cases patch tests in the socket were positive. Careful examination revealed no evidence of roughness or cracks in the plastic eyes. Emphasis is laid upon the importance of excluding such defects in the prosthesis, poor fitting, and acute or chronic infection, before making a diagnosis of allergy to a plastic eye.

Octin in the Treatment of "Vasodilating" Headache

"Octin" (methyl-iso-octenylamine) has been used in the treatment of a series of patients with migraine headache, histaminic cephalgia, and tension headache by G. A. Peters and W. W. Zeller (*Proceedings of the Staff Meetings of the Mayo Clinic*, November 9, 1949, **24**, 565). All the patients treated had acute attacks, and no medication other than octin was administered. The drug was given intramuscularly and by mouth: in the first group of patients in dosage of 0.5 to 1 ml. by intramuscular route as early as possible in the attack of headache; if no relief occurred the dose was repeated in thirty minutes. In this group complete relief was obtained in 26 of 59 attacks treated, partial relief in 22, and no relief in 11. There was recurrence in 10 cases. For oral administration "octin mucate" was employed, one 2-grain (0.13 g.) tablet every thirty minutes until relief was obtained; no more than four tablets were used in the treatment of any one attack. Of 26 attacks treated, complete relief was obtained in 10, partial in 5, and no relief in 11; there was one case of recurrence. No toxic or side-reactions were noted except for transient hypertension in six cases, in which average increase in blood pressure was 35/25 mm. Hg. In conclusion the authors state: "We have gained the clinical impression that best results with this drug may be expected in the treatment of typical migraine attacks . . ." Octin cannot be given by the intravenous route; the best results were obtained by intramuscular injections, and it should not be given to patients with pre-existing hypertension: "It is of particular value in those patients who may have abused the use of the ergotamine preparations and in those for whom the use of ergotamine may be contra-indicated".

Tetraethylammonium Bromide in Rheumatoid Arthritis

A series of 26 patients with acute rheumatoid arthritis has been treated for the pain in the joints with tetraethylammonium bromide by T. H. Howell (*Lancet*, February 4, 1950, **i**, 204). The drug was given in dosage of 5 ml. by intramuscular injection. Of the 26 patients treated, 16 had considerable or complete relief of pain for some time after administration of the drug; the periods of relief varying from 5 to 120 days. In one case there were nine successive good responses; in another, four; in four, 4 good responses; in four 3; in four 2; and in six, 1 injection produced a satisfactory result; in this last group one patient was free from pain for seven months. In most cases the effect of the drug was felt within one hour or less after administration. It is stated that "in the cases in which T.E.A.B. has not been effective . . . the pain originated in the circumarticular tissues and not in the joint". Some patients with massive fibrositis in addition to rheumatoid arthritis complained that the injection made the "soft-tissue" pain worse, even when the joints were relieved. Cases of osteoarthritis did not respond to treatment.

Enteric-Coated Aspirin

The results obtained in 32 patients with an enteric-coated tablet of aspirin are reported by R. H. Talkov *et al.* (*New England Journal of Medicine*, January 5, 1950, **242**, 19). The coating finally found to be most satisfactory contained cetyl alcohol, gum Sandarac, balsam of Tolu, and sugar. In 30 patients the analgesic effect was found to be as potent as with ordinary aspirin, and the onset of analgesia was only slightly delayed. Twenty of the patients invariably developed gastric symptoms when they took ordinary aspirin. Not only were all twenty able to take the enteric-coated aspirin without gastric distress, but it was also possible to increase the amount of aspirin they could take by 1.3 to 2.6 g. daily, thereby providing greater relief of pain. The maximum dose in these cases was determined by the development of toxic symptoms of central origin, not by gastric symptoms. In the four patients in whom serum salicylate levels were estimated, there was no appreciable difference between these levels with ordinary aspirin and with enteric-coated aspirin.

REVIEWS OF BOOKS

Recent Advances in Social Medicine. By ALAN CARRUTH STEVENSON, M.D., B.SC., M.R.C.P., D.P.H. London: J. & A. Churchill Ltd., 1950 Pp. viii and 124. Figures 15. Price 18*s*.

PROFESSOR STEVENSON in his choice of the subject matter of this book reveals his own conception of what Social Medicine is. With this there will be widespread agreement. It is strange to note that of the many published papers considered in this book only two appeared in the *British Journal of Social Medicine*. The author's prefatory remarks concerning the largeness of this subject and the degree of its overlapping with other specialties thus finds ample confirmation. He has wisely selected a number of topics within the general field and according to their importance, as assessed by him. He considers the more important and the more recent papers relating to these topics and, exposing them to critical observation, seeks a synthesis of their meanings. He deals with growth in children, infant mortality, the secondary sex-ratio, day nurseries, illegitimacy, the problem family, the school medical inspection, psychosomatic medicine, the adolescent in industry and the Pulheems system. As one would expect, Professor Stevenson has done a worthwhile job unusually well and many will be grateful to him, for in this book he renders notable service to Social Medicine, to those who teach it and to those who are taught.

Tuberculosis: A Global Study in Social Pathology. By JOHN B. MCDOUGALL, C.B.E., M.D., F.R.C.P.ED., F.R.S.E. Edinburgh: E. & S. Livingstone Ltd., 1949. Pp. vii and 455. Figures 29. Price 32*s*. 6*d*.

THAT tuberculosis epidemiology is a complex subject is an accepted fact and the salient question "which is the most important factor in the development of tuberculous disease—infection, inborn or acquired resistance, or an adverse environment?"—still defies an answer. The author of this book, who was Adviser on Tuberculosis to U.N.R.R.A. in Greece before becoming the Chief of the Section of Tuberculosis in W.H.O. in 1947, presents a study of this problem in the light of experience gained in many parts of the world. First, he gives some information concerning the general trend of tuberculosis in many countries, and then proceeds to analyse the factors which are generally held to have a bearing on the transmission of the disease. With this as a background he puts in a plea for a standardized method of compiling information to enable the tuberculosis situation to be assessed in a community and to make international comparison possible. Finally, he proceeds to evaluate the information obtained and to draw his conclusions as to the most important of these factors. These he regards as: (1) the tubercle bacillus; (2) nutritional factors; (3) natural and acquired resistance; (4) other environmental factors, such as overcrowding, bad housing; and (5) administrative services and "real wages". He discusses all these without bias, although it is clear that he reveals a slight partiality towards the importance of nutrition. Extensive use is made throughout of the world literature and the book occupies a unique place among reference books for tuberculosis specialists. A study of it will make abundantly clear what Ryle meant by the term "Social Pathology".

Perspectives in Neuropsychiatry. EDITED BY DEREK RICHTER, PH.D., M.R.C.S. London: H. K. Lewis & Co., Ltd., 1950. Pp. viii and 236. Price 15*s*.

FIFTY years ago there was no doubt that psychiatry was more of an art than a science. In recent years a great effort has been made to reverse this, and individual investigators have been at pains to make it quite clear that *their* work, at least, was based on sound scientific principles. As a result, there are those who have written papers without statistical evaluation and have been uneasily apologetic, and others who have pursued scientific exactitude so ardently that they seemed afraid of constructive thought. All this has produced the stiffness and dullness which characterizes much of our psychiatric literature. Perhaps the warm and human feelings which prompted a number of Professor Golla's past pupils and associates to commemorate his 70th birthday by presenting him with a volume of essays is responsible for a certain freedom and, in some instances, exuberance of presentation. The writers, we are told, have aimed at indicating the most promising lines of advance to be aimed at in the various fields of neurology and psychiatry, and without exception they are the people in this country who are best able to do so. It is only proper that Professor Golla should be honoured in this way, for his work has been marked by originality and erudition, which are fitting characteristics for one of the most distinguished research workers of our time. He is a man of wide culture, and the range of his interests is reflected in the varied titles of the essays which go to make up this volume. The text shows how profound his influence has been, both here and abroad. Although this is a highly

technical volume, in which even a psychiatrist may find much that is unfamiliar to him, it should stimulate both thought and action.

An Atlas of the Blood and Bone Marrow. By R. PHILIP CUSTER, M.D. Philadelphia and London: W. B. Saunders Company, 1949. Pp. x and 321. Figures 288, 42 in colour. Price 75*s*.

THE term "atlas" is perhaps a misnomer as applied to this book, which might more accurately be described as a sumptuously illustrated short textbook of hæmatology. The seventeen chapters give good brief accounts of normal blood formation of the normal blood cells, and of the pathological and clinical aspects of the various diseases of the blood-forming organs. The outstanding feature of the book is the liberality and excellence of the illustrations. They are nearly all photomicrographs, and many are coloured. Several of them are of high magnification (x 2280), and are masterpieces of the photomicrographic art. Not all are perfect, but by and large this is perhaps the best collection of photographs illustrating the cytology of the blood and bone marrow yet published. Some of the photographs of blood films are taken by the *bas*-relief method, which shows up the relevant points most effectively. A fair proportion of the photographs are of histological sections, as distinct from smears; these are uniformly of a high standard and many of them illustrate rare and interesting conditions. The book concludes with a useful chapter on the technique of bone marrow biopsy. The experienced hæmatologist will derive interest and pleasure from the perusal of this work, whilst the novice will find in it much that is instructive and enlightening.

Medical Books, Libraries and Collectors. By JOHN L. THORNTON, F.L.A. Introduction by GEOFFREY L. KEYNES, M.D., F.R.C.S. London: Grafton & Co., 1949. Pp. xviii and 293. Figures 20. Price 35*s*.

THIS "introductory history of the production, distribution and storage of medical literature from the earliest times", as the author himself describes it, will fulfil a useful purpose in assisting and facilitating the modern interest in medical bibliography. To compress such a mass of information into one relatively small volume obviously does not make for easy reading, but as a guide and as a reference book for the student of medical bibliography and medical history it will prove most acceptable. The information is accurate, balanced and well presented. It is brought well up to date, and some of the latter chapters, e.g., those on private medical libraries, medical publishing and bookselling, and medical libraries, will be of interest to many readers who are not particularly interested in bibliography. The two appendices—chronological list of medical societies and institutions, and chronological list of medical libraries, and institutions housing large medical collections—are a most useful collection of data not easily available in such a compact and convenient form.

NEW EDITIONS

The Sexual Perversions and Abnormalities, by Clifford Allen, M.D., M.R.C.P., D.P.M., in its second edition (Oxford University Press, 25*s*.) has been brought up to date and recent cases included. In the preface the author notes the increase in sexual offences as shown in the Home Office official publication 1939-45, and emphasizes the importance of treatment other than repressive and punitive measures. There is an excellent chapter on prevention and treatment, and another on the medico-legal aspects. Emphasis is laid on the importance of parental influence at the stage of puberty.

A NEW chapter, on "medical rehabilitation", has been added to *A Manual of Physical Therapy*, by Richard Kovács, M.D., in its fourth edition (Henry Kimpton, 26*s*.) in which the author states: "Convalescence should be no more considered synonymous with rest". In this chapter is included a "physical achievement chart" in use at the Massachusetts General Hospital, and measures for rehabilitating and re-educating patients to enable them to take their place in life are discussed in detail. Every aspect of physical therapy is included in this useful manual—heat and light, electricity, hydrotherapy, massage and exercises. The new edition is well illustrated.

Therapeutische Technik, edited by Prof. Dr. Karl Hansen, in its second edition (Georg Thieme: Stuttgart, DM 79.50) is contributed to by specialists in the different branches of medicine and surgery, and covers a very wide field: general medicine and surgery, obstetrics and gynæcology, orthopædics, pædiatrics, psychotherapy, dietotherapy, hydro- and balneotherapy and the different branches of physical medicine—these are some of the many subjects included in this comprehensive textbook of therapeutics.

The contents of the May issue, which will contain a symposium on "Occupational Diseases", will be found on page lxxiv.

Notes and Preparations, see page lxi.
Fifty Years Ago, see page xvii.